JUL 9 1942

FACTORY

MANAGEMENT AND MAINTENANCE

JULY 1942

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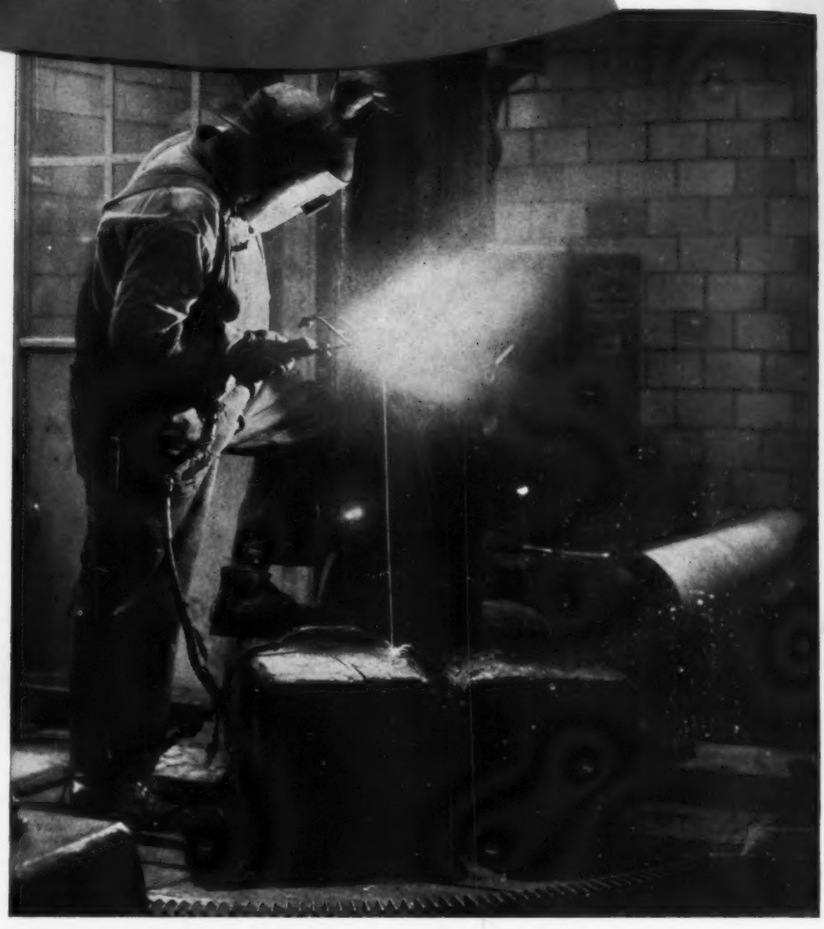

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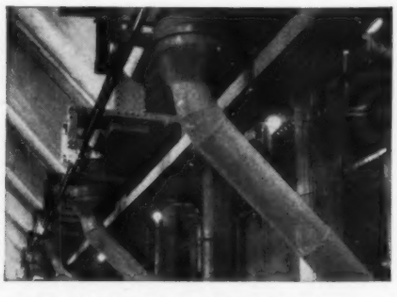

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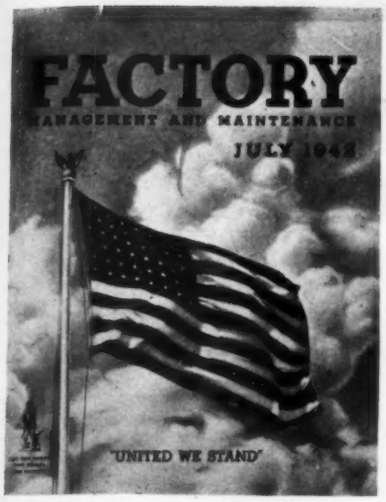

Gentlemen, the Flag! Factory honors it, as do other members of the business and industrial press, by displaying it in all its glory on this month's cover. Today, in the four corners of the earth, America's fighting forces are seeing to it that the Flag goes on waving. And today, in thousands of war plants America's industrial army is turning out equipment the fighting men need. For official rules governing the proper display of the Flag, turn to page 190.

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FACTORY

MANAGEMENT AND MAINTENANCE

JULY · 1942

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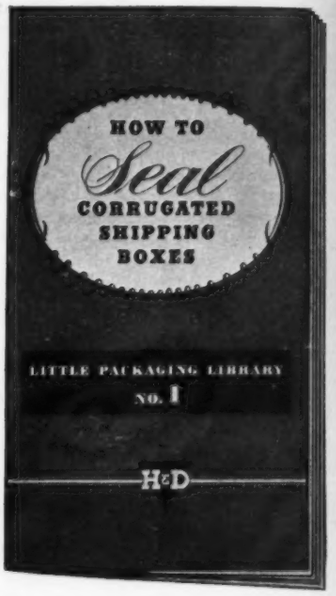

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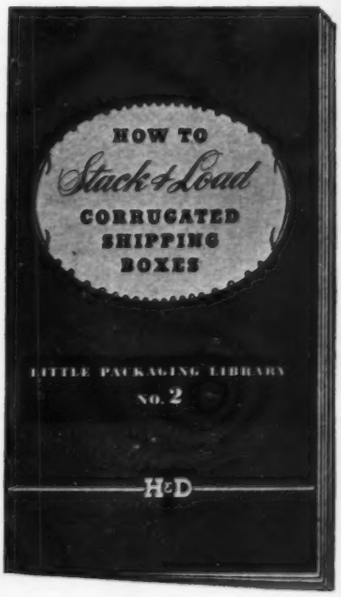

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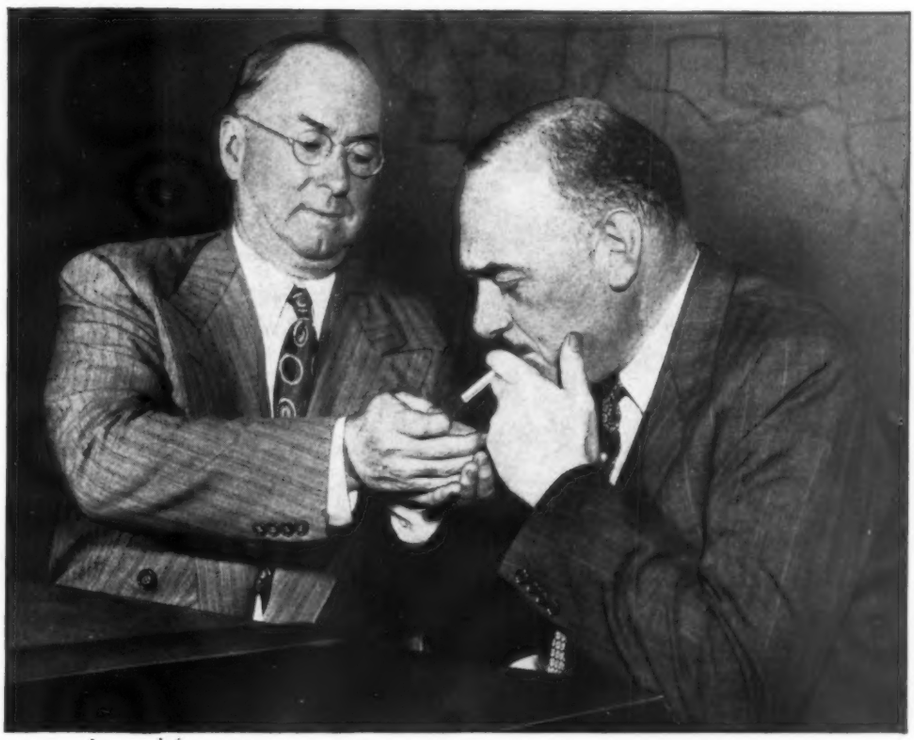
The Story That Must Be Told



Two men who know the story best: Donald Nelson, Chief of the U.S. War Production Board, and (right) Oliver Lyttelton, Great Britain's Minister of Production.

BETWEEN THE LINES of today's war news is written a story that is even more vital than the news itself. For through that story we begin to discern the pattern of victory, not yet complete in all its details but increasingly clear in its essentials.

It is the amazing story of how American industry has responded to the call for the weapons of total war, of how its technicians, workers, and managers are driving through an unprecedented task of fantastic size and complexity.

France fell in June 1940. During that month this country produced about $150,000,000 in war goods. By June 1941 the Nazis had overrun the Balkans; and in that month our war production was $800,000,000. The fateful month of December 1941 gave us an output of $1,800,000,000—an increase better than tenfold in eighteen months. And in May 1942 our total expenditures for war equipment and supplies mounted to the staggering total of $3,500,000,000.

This is an increase of twentyfold within two years, of itself a stupendous industrial achievement. But what is even more important, that achievement already is making itself felt the world over—in the Orient, in Australia, in Libya, in Europe, in the Coral Sea, at Midway Island, at the Aleutians, and wherever else we find a battlefront manned by free men.

To accomplish it, many industries have been pouring out war materials at a rate that only six months ago did not seem even remotely possible. Starting from scratch, our factories have turned from their peacetime jobs, first to meet and then to surpass the most hopeful estimates of what might be expected of them.

To do this they have drawn heavily upon all of their resources. Their skilled and unskilled

man-power has thrown into the task a war-born will to work; their research staffs have bent to it all of their scientific resources; their engineers have applied to it their utmost ingenuity; their executives have devoted to it the full measure of that managerial skill which has won for American industry the respect of the modern world.

For the first time in history we have pushed the accelerator of the world's greatest engine of mass production down to the floorboard. Always in times of peace, factory men have had to gear production to what the markets would take. But now the market they are called upon to serve is hungry for the last ounce of potential output. For war confronts industry with a demand limited only by its capacity to produce.

During these feverish months, while a desperate world has watched breathlessly to see how American industry would perform as the arsenal of democracy, we of McGraw-Hill have followed with mounting pride — at times almost with wonder — a new miracle of industrial achievement.

Some day the full story of this American industrial effort will fill a brilliant chapter in the epic history of our times. Meanwhile it would be premature to celebrate the completion of this task. For victory has not yet been won; that still lies at the far end of a road that we may find to be long and arduous.

But even now we can be certain of one essential of that victory. American industry is doing its job; it is delivering all that the people have asked of it — and more.

As I have watched with my associates the unfolding of this picture, I have wished that it were possible to broadcast it, in full color and wealth of detail, to the people of America, so that they could understand at least, in part, the job their industry is doing for them. It would help, it seemed to me, if the men of industry themselves, each so intent on his own task, knew what their fellow-workers in other fields have been doing.

However, the managers of industry have been far too busy ***doing*** to talk. They are going to be just as busy for some time to come. Naturally, many details are yet to be spread upon the record and, indeed, the full story cannot be told. But that part of the story that can be told is well worth the telling and the hearing, if only for its revelation of the spirit of an awakened America, throwing its all into the fight against the tyranny that has brought so many of the world's little people under its heel.

The 1941 war production of the United Nations, exclusive of the United States, equalled the total 1941 war output of Germany with all of its captive plants and enslaved labor. Since Germany's 1941 operations were at maximum capacity no further increase is possible. British output has been expanding to the point where its 1942 production is considerably ahead of Germany's.

In May 1942 American war production passed the British output 50 days ahead of schedule. In 1943 it will be 3 times that of the British.

This has been brought about under the leadership of Donald Nelson and the War Production Board, the Army, the Navy, the Maritime Commission, with the cooperation of management and labor. It has been furthered by the cooperation of Oliver Lyttelton, British Minister of Production, and other British production authorities.

But the story goes far beyond that. It gives us a glimpse of the America as it will emerge from this war, its industries again setting world standards of production, which will become the spearhead of our post-war economy.

This is a story that cannot be adequately told in generalities. It must be told in some detail. For instance, the great accomplishments of the machine tool industry, the great forward strides made by the aviation industry, the tremendous achievements of the chemical industry, the amazing conversion of many industries will warm the hearts of Americans.

These aspects of the subject deserve the fullest treatment and will be told month by month in these pages until the story has been completely unfolded. We will try to give a concise overall picture of the war job that industry has done and still is doing. You will find it a thoroughly American story of high American achievement in which every American can take pride and from which every American can take hope for the future of his country.

The story is far too significant to be withheld any longer.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

FACTORY
MANAGEMENT AND MAINTENANCE

L · C · MORROW · EDITOR

Serious Facts About Materials

Right now *materials* are the key to the production required to win the war. According to a most reliable authority, every victory, whether ours or the Axis's, has been due to superiority in equipment. It is obvious that we cannot have superiority in equipment on our many and distant battle fronts if we do not have in our factories the right materials in the right amounts at the right times.

Industry has reached the point where, literally, *production is a matter of materials.* Hence the curtailment orders by which the manufacture of more and more non-war products is stopped. Hence the directive that no new plants may be built unless they are absolutely essential for the war effort. Hence the decision that there must be a 30 percent cut in the projected 10-million-ton increase in steel-making capacity.

From sources either a part of, or not far removed from, national policy making executives, come statements to these effects:

1. A national stockpile of 10,000,000 tons of scrap metal must be attained through salvage in order to keep steel production at its present level through next winter.

2. There are likely to be times ahead when a shipway will stand idle for lack of steel, and an ammunition line slow down for lack of copper and brass.

3. At the present level of production (50 percent higher than the highest heretofore experienced) all the facilities entering into the production of basic materials are operating continuously.

4. At our present rate of metal consumption, we may have to resort to wrecking to obtain enough scrap to meet absolutely necessary requirements in the production of war goods.

These statements may astound in this country which possesses so great a proportion of the world's raw materials sources. But they will be taken at face value when our *rate of production* is remembered—a rate that has enabled us in 18 months to overcome the 5-year start of the Axis.

Continued and further cooperation by government and industry is required if our present rate of production is to be *increased,* as our national program says it must be. Between them, government and industry will do the following things, and others as the need becomes apparent:

1. Push to completion the projects under way to supply aluminum, copper, synthetic rubber, and other materials.

2. Make the most of existing stockpiles, *including inventories frozen by stoppages of application to non-war products.*

3. Make changes in design to use less of critical materials and to substitute the less scarce.

4. Take extensive, even drastic, steps to put idle materials into use, including ordinary scrap, obsolete machinery, and, if necessary, doubtful dies and fixtures and even unfinished product.

It is by these procedures that we shall bring about that superiority in equipment which will give the United Nations an overwhelming number of victories.

L C Morrow

Get Ready Now for

Here is the picture to date—what you want to know about the War Manpower Commission and its attack on our most serious problem to be. Management can get set *now* to ease the personnel dislocations ahead of it

TWO-POINT MEMO to management, re manpower (1) Don't expect a government labor "commissar" to move into your plant personnel office and take over tomorrow, but (2) don't fail to prepare now for total control.

These conclusions summarize a serious and intensive study by FACTORY of what may prove to be one of industry's most serious coming problems. It is too soon to attempt very many specific predictions. But FACTORY, after consultation with many well-informed men, will seek in this article to present a clear over-all picture of the situation to date.

Newspaper reports to the contrary, no workers have been "frozen" in war jobs by the War Manpower Commission, nor has anyone been told to "work or fight." Really drastic labor supply regulation with all the trimmings, such as priorities and mobile labor corps, is several months away at least. But, in a long war, intensive regulation is bound to come.

When? FACTORY has diligently trod the corridors of Washington for several weeks, getting guesses from the experts, the high and the low, and asking, without much deviation, this one question:

"At what point do you expect an acute general shortage of manpower?"

The experts say frankly that they are guessing. Their estimates range from September, 1942, to June, 1943. *The consensus is November, 1942.*

This is the first time in history that anyone has closed the switch on the American industrial machine and let it run at full speed. What will slow it down first—lack of materials, transportation, or manpower?

Your guess is about as good as the experts' because the pros and cons of prediction are so numerous and so hard to weigh. For example, 24,000 plants that were in business in 1939 will be out of business this fall (WPB estimate). Some 1,500,000 construction workers may be laid off by the end of the year. The retail and service trades are due for a slump (in England 25 percent of the retailers have been wiped out by the war).

But those 24,000 plants accounted for only 8 percent of industry's 1939 production volume. The predictable demands of a handful of big companies on war work can easily absorb

OEM photographs

Employers who hire women now will get the pick of a labor supply source which may, in time, run thin. In England 5,500,000 women are employed in industry today. Proportionately that would be 15,000,000 in the United States—ten women for every woman employed now

Manpower Control

Over-age workers are as sure to stay on the job as handicapped men. Only 5 percent of those above 40 are physically fit for the Army

the numerical equivalent of all those due to be laid off in the building and service trades. One company alone will soon be producing war goods at the dollar volume rate of a Panama Canal every six weeks.

Even the gloomiest prophets of materials scarcity have yet to predict a general shortage that will curtail military and *essential* civilian production. The National Industrial Conference Board has estimated total employment at 53,376,000 in April and unemployment at an almost irreducible 1,750,000. To the 53,376,000 add the men in the armed services and it is plain that in April we were utilizing more than the normally estimated total labor force which few sources have ever rated above 55,000,000. If, despite local variations, we were drawing nationally on the "reserve" labor forces in April, it seems likely that we shall hit a war production peak *sometime* this fall that will offset any possible unemployment due to civilian curtailment.

That's what the experts say, at any rate. It is said also that the Army is well ahead of schedule on inductions, can easily surpass the expected 4,200,000 of December 31, 1942. In fact, some observers say that the Army could, if necessary, enroll 7,000,000 men by the year's end—which would intensify manpower shortages on the home front incredibly. This possibility should be kept firmly in mind. The answer is partly up to the Axis.

Democracy's Delay

If this were not a democracy, drastic regulation would already be well on the way. Some of New York's 400,000 unemployed, for example, would be herded into trains and shipped off to Detroit where industrial employment, according to a WPB survey, will hit 660,000, just 50 percent above peacetime peaks, by November 1.

But this *is* a democracy and democracies tend to wait for a crisis before evolving a solution. Hence the period of drastic regulation will date *from* the period of acute general labor shortage and there will be an experimental time lag in developments thereafter.

However, the Chairman of the War Manpower Commission, Paul V. McNutt, is regarded as an able and determined man who realizes that he has got to succeed, to the general satisfaction of the nation, by any necessary combination of persuasion and compulsion. McNutt is gathering a competent staff. Given the benefit of the indicated time lag, the WMC should recover effectively from a very slow start.

Total mobilization, it is believed, will take form along English lines. We shall move toward something resembling British National Service, the big philosophical point of which is *essentiality*. Under National Service, individual usefulness transcends all other considerations. Recruiting and volun-

teering (military and industrial) cease. Assignment and allocation take their place. Compliance is largely voluntary, but legal compulsions reinforce it. Management's peacetime hiring prerogatives are severely restricted, but since public opinion is strongly on the side of National Service it does management little good to complain, irritating as it may find the fact that labor has a strong voice in the determination of mobilization policy.

One may ask, what has America's War Manpower Commission accomplished to date? By comparison with the complete British program, very little. But if viewed in the abstract, quite a bit. Quite enough to suggest that there are many things management can do to prepare now for events almost certain to come. And the best opinion of many experts can be summarized in about this way:

Over-all, employers should build their personnel structures to endure throughout a war, a $200,000,000 war, that is being planned and will be fought on a four-year basis right up to the day it ends. Since government thinks that way, management must also. Management must then:

1. Get set for the time when the government will assign to it a minimum number of essential jobs—not men, jobs—which the government will then contract to keep filled. For the rest of its jobs management will have to make shift with what it can.

2. Get set for the time when it will be called upon to demonstrate the essentiality of its own operations

Which of America's Industries Are "Essential"?

No one can say exactly which U. S. industries will be declared essential, but experience in Britain and Canada may provide clues

In Britain

Under the Essential Work Order, the following industries have been held to be engaged in essential work and hence entitled to labor supply preference:

Ship operation and management

Coal mining and ancillary processes

Building and civil engineering (including construction of necessary buildings docks, harbors, bridges, roads, canals, railways, airdromes, also operations and manufactures pertaining thereto)

Iron and steel (including mining and quarrying, blast furnaces, rolling, forging, founding, also manufacture of nuts, bolts, riverts, screws)

Agriculture (Scotland only)

Railway operations

Cotton manufactures

In addition some 20,000 firms have been listed in the British Schedule of (Essential) Undertakings. Names have never been made public, nor has Britain announced the industries which it does not consider essential

"Restricted Occupations" in Canada

It is forbidden to employ men of military fitness (except by special permission of a National Selective Service officer) in the following occupations:

Bookkeepers

Cashiers

Office appliance operators

Messengers

Salesmen

Sales Clerks

Taxicab drivers

Any occupation in, or directly associated with, entertainment, recreational, or personal service, including but not restricted to theaters, and also including:

Film agencies

Motion picture companies

Clubs, bowling alleys, poolrooms

Sports

Barbering, hairdressing

Domestic service

Dyeing, cleaning, pressing

Laundering

Hotels, lodging houses

Baths

Restaurants, cafes

Any occupation in the manufacture or production of the following:

Biscuits

Confectionery

Cocoa

Bread and bakery products

Aerated beverages

Liquor, wines, beer

Rubber products

Tobacco, cigars, cigarettes

Leather and fur products

Textile products

Furniture, upholstering

Photography

Printing, publishing, engraving

Shoe shining

Guide service

Funeral service

Also any occupation in the repair of:

Clothes

Boots and shoes

Furniture and household equipment

Jewelry or watches

Musical instruments

Radios, refrigerators

Washing machines, vacuum cleaners

Jewelry and watchmaking

Pottery and china

Soaps, toilet preparations

Mattresses

Musical instruments

Barber and beauty shop equipment

Cameras and films

Sporting goods

Games, toys, novelties

"Vital to Prosecution of War" in U. S. to Date

Although selective service law forbids blanket deferments, Selective Service Headquarters has so far designed as "vital" the following industries in memoranda to local draft boards, to whom were also furnished lists of critical occupational skills within those industries (number of skills listed is shown at the right):

Ship construction and operation	159
Electric power production, transmission, distribution	86
Coal mining	62
Transportation	79

MANPOWER SCHEDULE

	Dec. 31, 1942	Dec. 31, 1943
Men in armed forces.....	4,200,000	7,000,000
Men in war work.....	15,000,000	16,000,000
Men in non-war work.....	21,352,000	17,931,000
Total men of producing age (18 to 60).....	40,552,000	40,931,000
Old men and boys.....	27,233,000	27,487,000
TOTAL MALES	67,785,000	68,418,000
Women in war work.....	2,500,000	4,000,000
Women in non-war work..	38,002,000	36,880,000
Total women of producing age (18 to 60).....	40,502,000	40,880,000
Old women and girls.....	26,818,000	27,069,000
TOTAL FEMALES	67,320,000	67,949,000
GRAND TOTAL	135,105,000	136,367,000

and begin amassing data to that point. This will not apply so much to companies—and perhaps whole industries—which are obviously so essential to the war effort that they may be so declared.

3. Get set for the day when it may have to prove to government plant inspectors that it has upgraded and utilized skills to the highest limit, that it has exhausted reserve types of local labor (women, negroes, older workers, handicapped workers, certified aliens), and that it maintains an in-plant training system equal to minimum government requirements. All this to get any preference in labor supply at all.

That's long-range, of course. It doesn't mean that management should turn out all its younger men tomorrow and load up on reserve-type workers. It does mean that, for replacement and expansion, management will do well to increase the *proportion* of its reserve-type employees. Short-range, here are two suggestions: (1) Management should leap at any opportunity to take a strong part in regional WMC Labor-Management Committees which will be named shortly; (2) management should intensify its morale-building job—especially with a view to "selling" younger married employees on the importance of what they are doing in the plant (the dependency allowance will move many of them to volunteer for military service).

Hints to Employers

It is impossible to generalize further. A manufacturer of powder puffs might be well advised to re-staff his entire plant immediately with one-armed negro women, aged 60. On the other hand, a manufacturer with a monopoly—if such there be—on some vital bomber part might pirate labor, hoard labor, and defy the regulations with perfect safety.

Readers may find some information bearing on their own cases under the following itemized headings:

Women. In a long-war labor scarcity, employers who took the pick of the women while the supply abounded might have cause to congratulate themselves. Save for the West Coast, no urgent necessity for employing women appears to exist at the moment. But England provides an eye-opening example of the situations that all-out war can bring.

In England 5,500,000 women are currently employed in industry. Proportionately, that would be almost 15,000,000 in the United States—ten for every one employed now. This goes far beyond all current conceptions of "reserve" supply and includes grandmothers, spinsters, and 'teen-age girls.

In England the registration and conscription of women for war work boiled down quickly to a mere question of traffic regulation. Far from resisting, the women have been almost too eager to participate. Recently 1000 of them marched on Downing Street demanding the right to bear arms. In fact, the only resistance came from soldiers who didn't want their wives to work.

British regulation, possibly the precursor of policy here, has had two aims—to organize the young, single women into mobile groups; to channel the work into areas convenient to housewives and other, more settled women. Little subcontracting "factories" have been started in village halls. Communal nurseries abound. With it all, sound trucks still patrol the towns begging every last "part-timer" to join in.

Handicapped workers, older workers, illiterates. Two years from now an employer may look with pride in his own foresight at having hired a one-legged operator who was otherwise sound of wind and limb. The number of handicapped workers is small, however—about 400,000—and a long war is pretty certain to absorb them all in industry.

Currently the handicapped worker is still a trifle hard to define. About 25 to 35 percent of Army candidates in all age groups are being rejected after physical examinations. Now, however, Selective Service is reaching back into the 1-B's and finding some right useful fellows who can release more active men for combat duty. This trend will doubtless continue.

For most purposes the over-age employee is almost as sure a bet to stay on the industrial job as the genuinely handicapped. Only 5 percent of men in the 40 to 45 age group are physically fit for military duty.

A little-considered labor source is

the nation's still large group of illiterates. No less than 433,000 men have been barred from the Army and Navy so far because they can't read and write. Eventually Uncle Sam may have to give them some education. Or the Army, as it did in the last war, may change its rules.

Negroes. Semi-skilled and skilled jobs are opening up to negroes in areas—Connecticut, for example—where labor supply is really short. Necessity and pressure are combining to break down old barriers. The President's Committee on Fair Employment Practices has cited many manufacturers for alleged discrimination. WMC has set up an active Negro Manpower Service. But negro organizations, by no means satisfied, have launched a national job equality campaign, scheduled to end in a march on Washington.

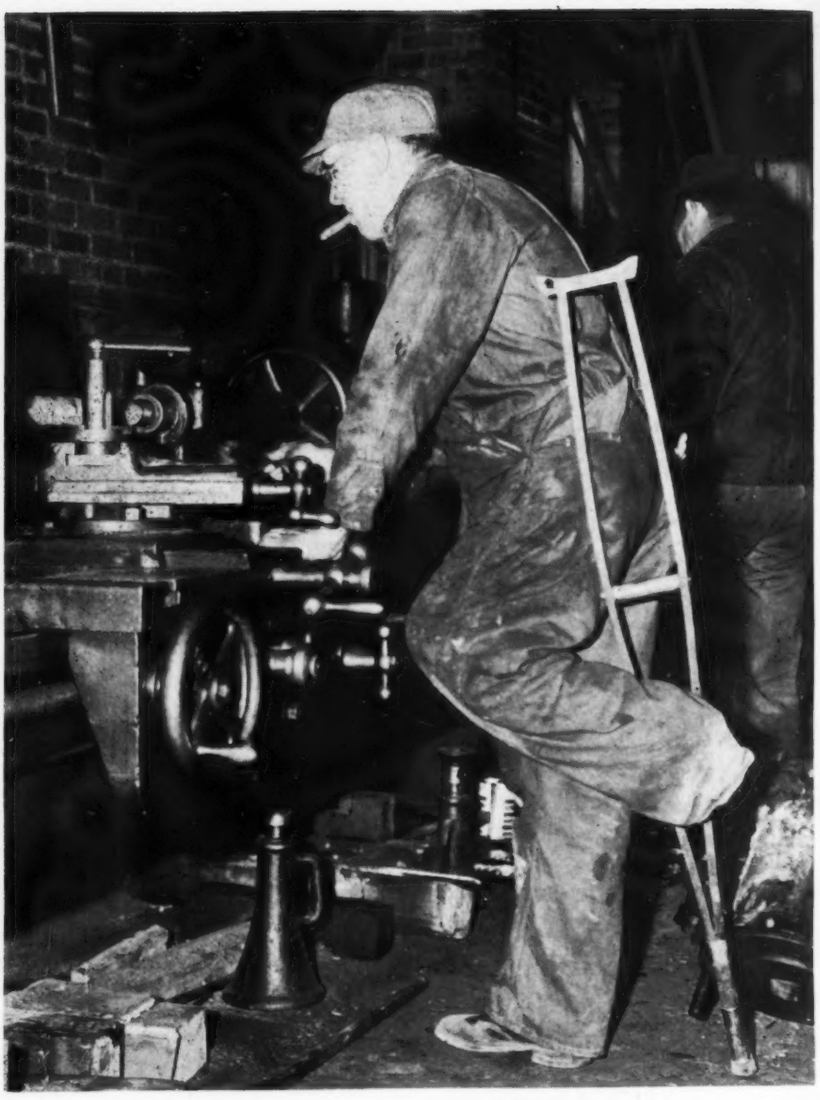
Dual Obstacles

Actually white employee resentment is fully as much of an obstacle to the wider hiring of negroes as is employer discrimination. In Detroit last month, 350 white Dodge Truck employees stopped work when more negroes were hired. Only the pleas of CIO officials ended the dispute. Many unions, incidentally, have long excluded negroes.

WMC officials admit they know of no easy answer to this problem. They merely hope that white workers will bury the hatchet in patriotism.

For the employer this ticklish problem is largely a local one. In areas where negroes are numerous he will be expected by WMC to hire a proportionate number, but he will not be asked to accept them from other sections. Some employers are running negro departments or shifts. Sun Shipbuilding will employ 9000 in its new all-negro yards at Chester, Pa., and will upgrade negroes to replace white supervisors.

Married men. One of the real headaches of the new dependency allowance may prove to be the number of industrially essential married men who will seek to enlist. The Army hasn't helped by doubling to 3000 a month the number of 3-A volunteers it will accept for officer training. One factor may deter volunteers. Dependency allowances, while retroactive to June, are not scheduled to be paid until November 1.



Two years hence employers may congratulate themselves on their foresight in having hired some of our 400,000 handicapped workers

As a matter of fact, most married men, and certainly most family heads, are not likely to be called for a year—barring always the possible sudden doubling of Army inductions. First to be reclassified to 1-A will be the 3-A's who have remote dependents, such as grandmothers. Next will come men with working wives, and finally family heads.

Technically trained men. Take careful note of the fact that the National Roster of Scientific and Specialized Personnel (see FACTORY, "Will Conscription for War Work Come?" February, 1942) has been transferred to the War Manpower Commission. For non-defense employers with no great claim to essentiality this is plain bad news.

In general it means that WMC will push along the job to supply technicians to the armed services and essential industries, allocating them from the schools and from less essential jobs as requirements arise. Available also to aid in the task is the "stockpile" list of engineers and other technicians which the U. S. Civil Service Commission has been building. Comes now the Army Specialist Corps which will receive thousands of applications from technical personnel.

Tremendous and complex is the job of sorting out all these data and organizing for systematic distribution of technical men. Under forced draft it

may take a year. Yet mobilization does hasten the day when men on the Roster may find themselves suddenly transferred from one job to another as the national need may require.

Priorities, essentiality. The actual operation of labor supply priorities must await many other developments. Nonetheless, manufacturers will do well to study their chances. Definitions of essentiality are being drawn up by the government now. It is doubtful that the term "non-essential" will ever be officially applied. For a clue to the way in which one government, the Canadian, has inferentially defined them, however, turn to the table on page 60.

In that connection, it is noteworthy that the British Labour Minister designates "essential undertakings" plant by plant for the most part. If we follow this precedent, the question is raised: Will there be some sort of machinery within WMC to hear individual appeals? WMC officials are working on this now and plans will be ready when the occasion arises. FACTORY's guess is that a good many companies may benefit, later on, if now they begin to gather material for a strong factual presentation of their preference pleas. Of course, most major preference decisions on labor will be more or less arbitrary, based on military and naval needs, and they will change as they have in England, almost from day to day.

What the Manpower Commission has done. First, these are the things WMC *hasn't* done: (1) "Frozen" war workers in jobs; (2) made the United States Employment Service industry's sole hiring agency; (3) called a halt to "pirating" and "hoarding"; (4) set up an inspectorate to compel upgrading and training and utilization of local labor reserves; (5) codified Selective Service procedure with rigid rules; (6) created mobile labor corps; (7) created broader machinery for wholesale movement of workers to critical areas; (8) set up a system of priorities in labor supply and declared certain jobs and industries "essential."

This is also a list of the practical elements of total mobilization. Some of them cannot be accomplished without legislation.

The fact of the matter is that the whole program is stalled by a single obstacle. You can't stop pirating, for example, unless you first freeze men in jobs and you can't do that unless you can make USES the single hiring agency. Labor insists that it won't stand for job "freezing" until wage stabilization is completed and is using the situation to force stabilization. The fact that no one government agency is responsible for stabilization merely complicates the problem further.

Limits to USES

For the rest, USES is simply not geared to attempt the single-agency function nationally, may never get to that point. It *is* being groomed, however, to take over in critical areas.

Now these are some of the things WMC *has* done. It has begun classification of occupational Selective Service questionnaires into three groups of skills—critical (in which nationwide shortages exist); essential (in which shortages are anticipated); and "neither." These data will be the guideposts if, later, a genuine "work or fight" order becomes necessary. It has also begun compilation, through USES research, of data to determine industrial essentiality. The job will take months.

WMC has also formulated its 8-point program including the above and directing local draft boards to consult with USES on occupational essentiality of individuals; directing the Farm Security Administration to expand mobile labor camps of agricultural workers; and directing USES to give preference to war plants in referring workers for jobs. Plus this, off the record WMC has weighed in heavily on plant site locations and has made its views on labor availability the

HERE IS A SIMPLE AND INEXPENSIVE WAY FOR industry to insure the supply of man hours: Contribute to "The War Production Fund to Conserve Manpower." This fund is being collected to enable the National Safety Council to undertake an accident prevention program commensurate with the job to be done under today's conditions.

That job is a big one. In 1941, *102,500 people were killed in accidents; 350,000 were permanently disabled; 3,970,000 workers were injured; and 480,000,000 man-days were lost to industry.* The toll is increasing.

With all the manpower of the nation being mobilized, it is not enough that only 25,000 industrial plants have effective safety programs. The other 171,000 plants should have them too.

The National Safety Council does not limit its activities to industry. But industry will benefit from the non-industry activities in this way: All employables soon will be at work. Any time they lose from that work represents lost production. That production is lost just as surely whether the accident takes place within or without the industrial plant.

FACTORY earnestly bespeaks industry's support for this movement to conserve manpower.

dominating factor in a number of important plant location decisions.

What the Manpower Commission will do. First, within the framework of all the foregoing, place any development occurring since June 26. Then you will have a fairly accurate picture of developments to date on the manpower front. Watch for a WMC statement of policy (the next best thing to an order) declaring USES the single hiring agency in certain cities. No open compulsion will be employed; every attempt will be made to "sell" the plan. To this end, watch also for the appointment of regional WMC directors, backed up by regional Labor-Management Committees. The regions may parallel the War Production Board's "Little Nelson" set-up, and the directors may be chosen from among men of national prestige in labor relations.

Generally speaking, however, the outlook is that mobilization will not "get going" broadly until the wage stabilization issue is solved. But this does not mean that industry shall stop analyzing and planning for eventual total mobilization. Nor should it underestimate WMC. This Commission, or something so much like it that no one will know the difference, will do the job. Total war *means* total control—and this *is* total war.

Slogans for Your War Bond Drive

NEXT TO INCREASING OUTPUT of war materials, the best thing any industrial plant can do to help win the war is *urge every employee regularly to invest a portion of his pay in War Bonds.* Every dollar thus allocated means one less dollar available for the purchase of non-essential goods and services which are becoming scarcer all the time. And since it is the 15,000,000 wage earners in industry who are getting most of the huge increase in national income, it is vital that as much as possible of this increased purchasing power be diverted. That, short of higher taxes on wage-earner incomes is the surest defense against inflation.

To help insure the success of your War Bond Drive, FACTORY has selected ten slogans from the several dozen suggested for use in the Greater New York War Bond Pledge Campaign. Use them. Or write your own. And help your employees to regularize their investments through payroll deductions. Remind them that every dollar invested now in War Bonds means more than a dollar in added purchasing power after the war.

Scoreboard provides best way to keep factory employees posted on the progress of your War Bond Drive. A thermometer is one of the simplest scoreboards to build, certainly is easy to read. This big fellow at Northern Pump Company, Minneapolis, indicates 100 percent participation

BUY WAR BONDS
Tokens for Tokyo

BUY WAR BONDS
Shackle the Axis

BUY WAR BONDS
Sign Up Today
The American Way

BUY WAR BONDS
Your Pledge Receipt
Blasts Axis Deceit

BUY WAR BONDS
Each Buck You Release
Buys a Share in the Peace

BUY WAR BONDS
American Spirits
Are
Battled in Bond

BUY WAR BONDS
A Pledge a Day
Keeps the Axis Away

BUY WAR BONDS
More Vitamin B-25
for Hirohito

BUY WAR BONDS
Gag the Axis Gangsters

BUY WAR BONDS
Remember Your Dollar
Will Make a Jap Holler

Weigh to Get Quick Counts

Hand counting of small parts is expensive and inaccurate. Screw machine operators in this plant are paid on the number of pieces they turn out. Scales have proved the solution to the problem of correct counting for all record-keeping purposes

R. F. NORTMAN and WILLIAM S. HANSEN,* Production Engineers, Harley-Davidson Motor Company, Milwaukee

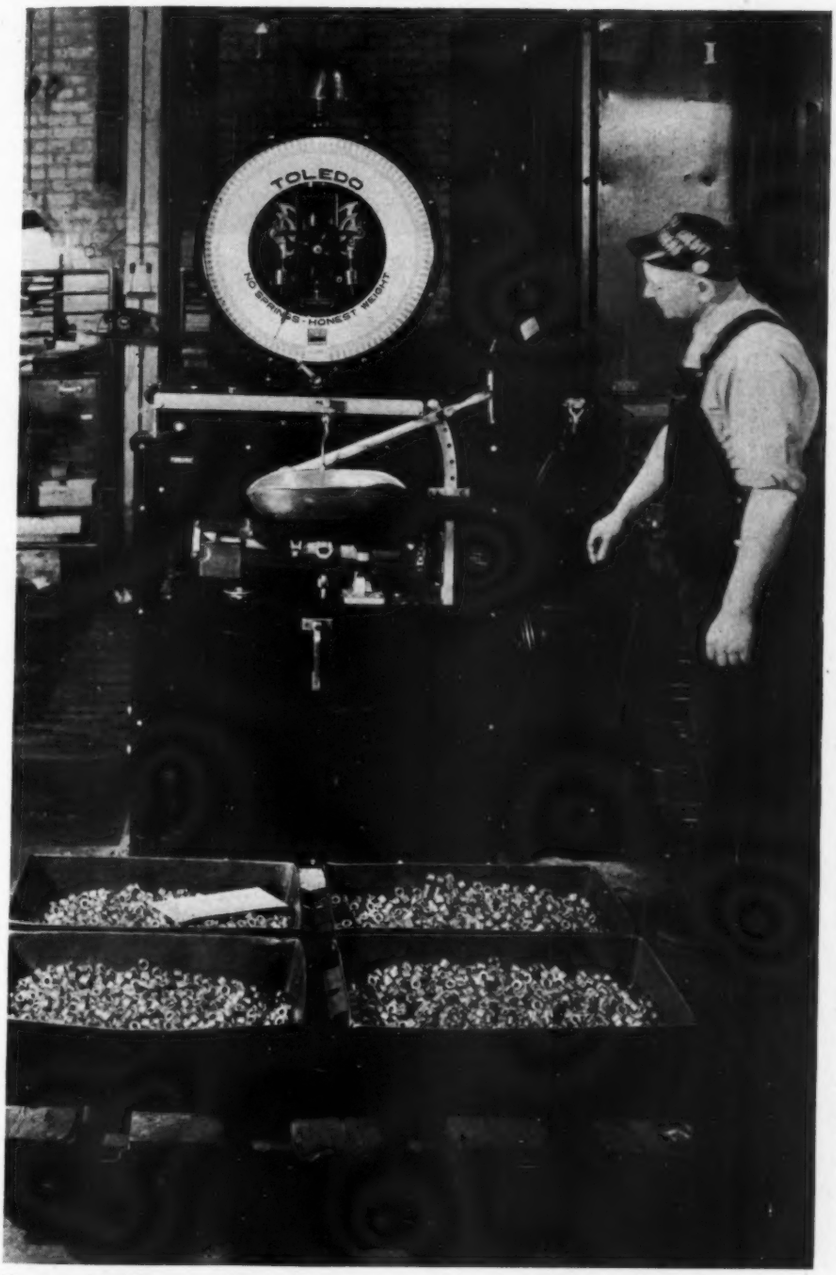


Figure 1. Thousands of pieces can be counted at once. Containers are uniform in size and weight to simplify adjustments of the tare beam

THOUSANDS OF PRECISION PARTS go into our product—parts so small that some of them weigh as little as 0.0001 pound. As these tiny pieces are finished by the automatic screw machines, they are sent to the various stockrooms. From there they are taken, as needed, to final assembly. And each move requires some sort of record.

Without counting equipment, parts would have to be counted by hand when checking machine production, incoming or outgoing shipments, disbursements from stockrooms, or any movement of parts that requires transfer from one record to another.

Unfortunately, accurate counting is a difficult process for the average worker. Mental counts are costly because of the tremendous amount of handling involved and the inevitable uncertainty of the results. This is true especially when the parts are irregular in shape, or tiny and light.

An investigation of the costs of counting in our various stockrooms led to the installation of the equipment shown in the photographs. This equipment has replaced hand counting entirely. Figures 1 and 2 show three counting and weighing scales that are used to count the parts produced on automatic screw machines.

Machine operators' earnings are based on the number of parts produced. Counts as obtained on this counting equipment are tabulated on job tickets which accompany the job. These tickets are sent to the timekeeper for posting on the operators' timecards. It is necessary that counts be accurate, to prevent errors in determining the operators' weekly earnings. With this equipment there has never been a complaint.

This equipment is used also to control the movement and transfer of

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* Mr. Hansen is now production engineer at Hart-Carter Company, The Lawson Division, New Holstein, Wis.

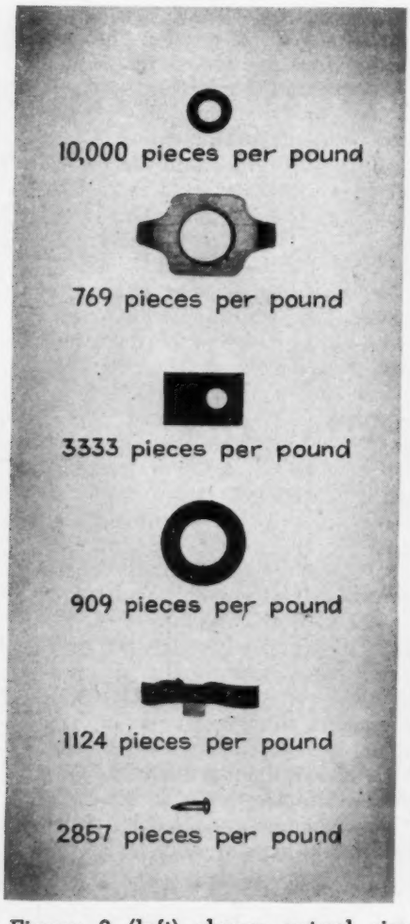
parts to assembly lines and other production departments.

In Figure 1 a typical lot of several thousand pieces is being counted. Containers and skid platforms are of uniform size and weight, thus simplifying the adjustments of the tare beam. With this set-up of three scales it is possible to count any quantity of parts produced on the screw machines, all the way from small screws to parts lots weighing three tons.

The six parts shown in Figure 3 are typical. They are manufactured in lots of two to three thousand pieces, and are sent to the stockroom for disbursement to the various assembly departments in lots of four to eight hundred pieces.

Figure 4 shows counting equipment used in stockroom. The small scale in the background is used to count extremely small and lightweight parts. The bench dial scale in the foreground is used to count parts that are too large for the other scale. Note how the scale has been recessed in the table to eliminate lifting loads to the scale platform.

Figure 2. Operator's earnings are based on number of pieces produced. No complaints have been heard since counting equipment was installed. These scales count product of automatic screw machines


10,000 pieces per pound
769 pieces per pound
3333 pieces per pound
909 pieces per pound
1124 pieces per pound
2857 pieces per pound

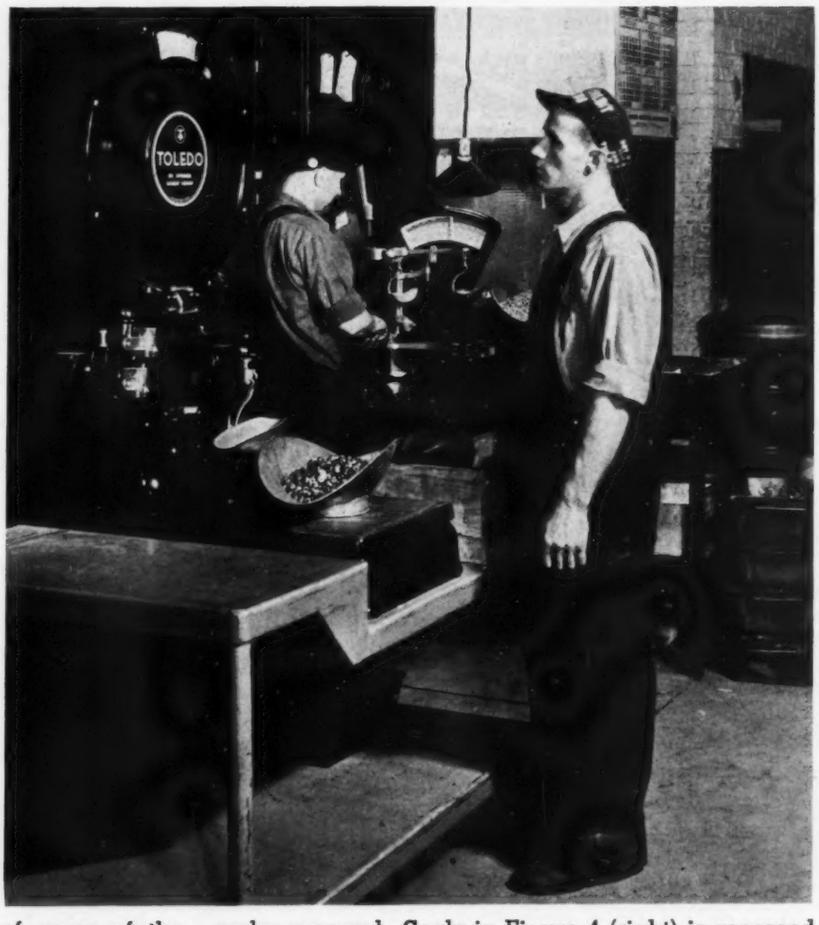


Figure 3 (left) shows actual size of some of the pieces counted by weight, and how many parts make a pound. Scale in Figure 4 (right) is recessed in table to eliminate lifting loads to the platform

Trailer Takes 140 to Work

ONE ANSWER TO THE PROBLEM of transporting workers to outlying essential-industry plants is the oversize bus trailer picture here. The trailer is built almost entirely of non-critical materials, and is hauled by an ordinary 1½-ton truck tractor.

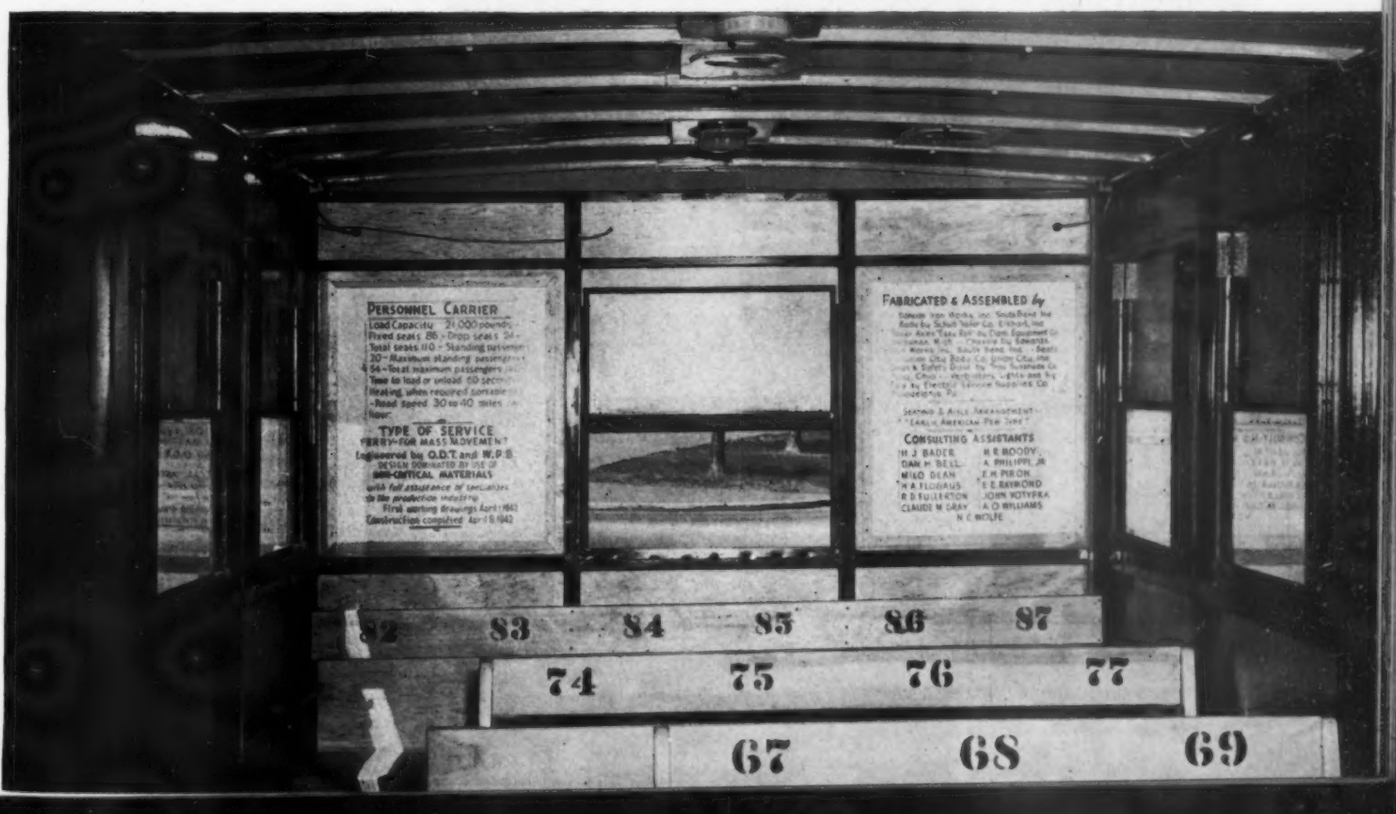
Up to 140 passengers can ride at one time—three times as many as in an ordinary bus, and twice as many as in a large streetcar. There are 86 fixed seats and 24 drop seats.

Trailer was designed by the Office of Defense Transportation and War Production Board officials, with the cooperation of private companies: Fabrication, assembly, and chassis, Edwards Iron Works, Inc., South Bend, Ind.; body, Schult Trailer Company, Elkhart, Ind.; trailer axles, Clark Equipment Company, Buchanan, Mich.; seats, Union City Body Company, Union City, Ind.; sash and safety glass, Troy Sunshade Company, Troy, Ohio; ventilators, lights, signals, Electric Service Supplies Company Philadelphia.

OEM photographs

As many as 140 passengers can ride to work in this bus trailer, designed by ODT and WPB officials

Takes only 60 seconds to load or unload. There are 86 fixed seats, 24 drop seats, plenty of standing room



Highlights From Campaigns

Best morale-builder at Northern Pump was twins contest, "twins" being Navy slang for the anti-aircraft guns Northern builds. Company offered $1000 for first twins born to an employee. The Barron boys, arriving six weeks later, enabled their proud parents to collect

Photo by Minneapolis Star-Journal and Tribune

Fifth in *Factory's* current series of reports* on morale-building techniques used in war production drives by America's leading plants

WENN SIE in Minneapolis ankommen, betrachten Sie auch diese Bezirte als Kriegsobjettive!

Translated, this means "When you reach Minneapolis, consider these areas also as military objectives."

Thus speaks a monocled Nazi air officer, addressing a group of fliers and pointing to a map.

This scene was depicted in a newspaper advertisement which startled the readers of Minneapolis newspapers not long ago. Sponsored by the Northern Pump Company, it voiced a compelling plea for support of the American Red Cross.

The advertisement was just one in a series of equally startling messages, all part of a broad and vigorous morale-building campaign. And this campaign is just one of a thousand drives to stimulate the will to win throughout America's war industries.

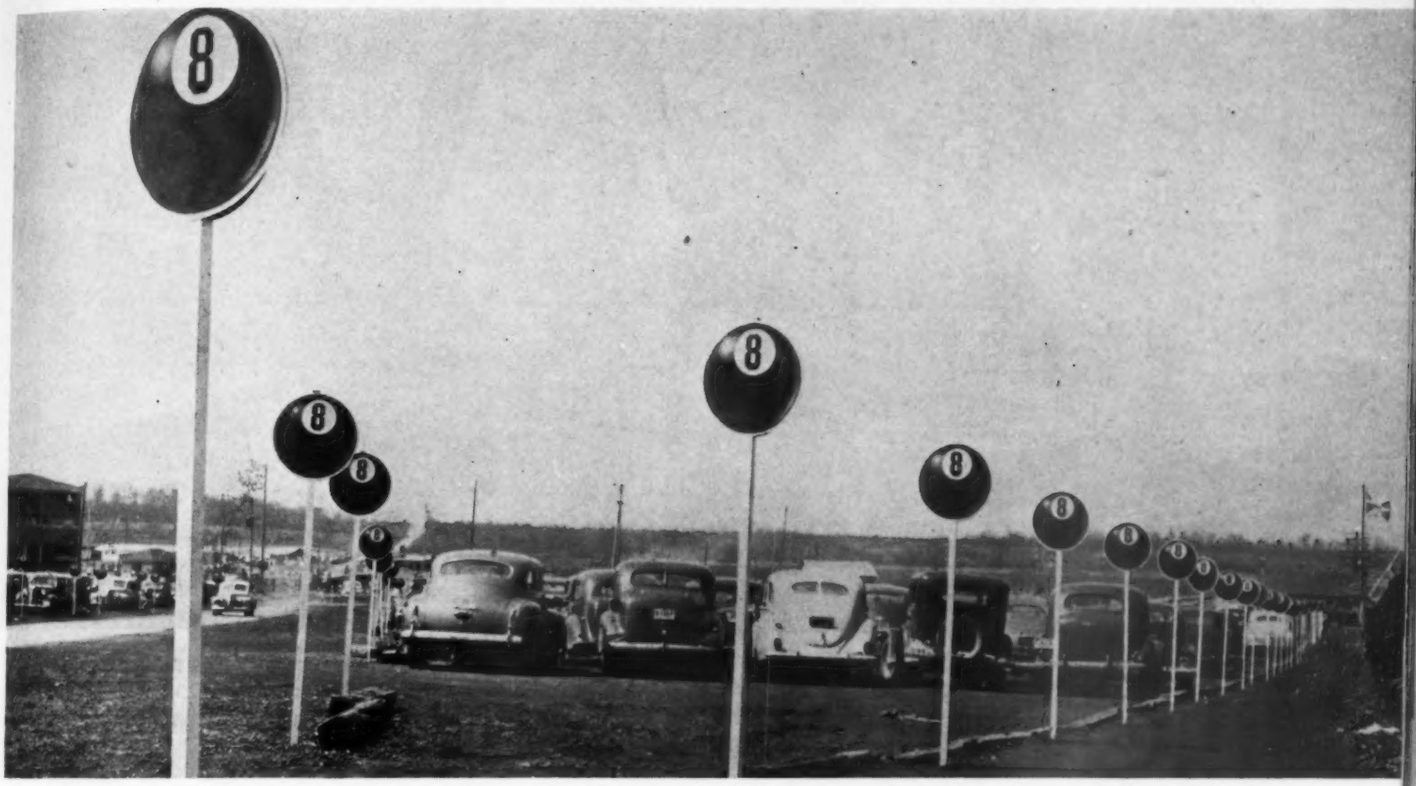
Another, and excellent, example is the Goodyear 8-Ball Campaign. For, at about the same time that the people of Minneapolis were blinking at Northern Pump's arresting advertisements, the citizens of Akron—particularly those who work for Goodyear Aircraft Corporation — were surprised to discover, one bright morning, that a strange new symbol was mysteriously pervading the city.

Rows of little round signs, simulating the billiard "8-ball," lined the highways and fences outside the plants. Big placards appeared in the shops and offices, and 40-ft. banners were hung, all bearing the 8-ball sign. On billboards near the plant and even on the fronts of buses the same symbol appeared. In newspaper ads and in radio announcements it was seen and heard.

No one knew just why. Switch-

* How RCA Builds Worker Morale (March); When Workers Get the Will to Win (April); How to Build the Will to Win (May); Case Studies in Building the Will to Win (June).

That Build the Will to Win



Mysterious 8-ball signs appeared on a Sunday along roads near Goodyear Aircraft plant. Placards, banners, billboards bore the strange device. Suddenly it appeared on Akron's buses and public buildings. Teaser ads in local papers helped to arouse curiosity. On Wednesday the significance of the 8-ball became plain when slogan (below, left) was added to all dispays. The 8-ball was then revealed in plant magazine, press, and radio as symbol of production drive. By end of week thousands of Goodyear Aircrafters had signed production pledges, were proudly wearing 8-ball pins

Pants go down as production, symbolized by shells, goes up on this interesting scoreboard at Lewis Foundry & Machine Division of Blaw-Knox Company. Another novel Lewis sign, one of several, shows the rising sun behind a V-shaped aperture in the center of the board. Daily increases in output are recorded by indicators at side of board while a panel rises, fills the V, and blacks out the Jap

boards were flooded with the calls of the curious. Said the radio, in frequent spot announcements:

"1-2-3-4-5-6-7-8 . . . Remember that last number . . . 8 . . . It may mean your job . . . your home . . . and your country . . . Your lives and the lives of those you love may depend on it."

The mystery campaign began on Sunday. By Wednesday the War Production Drive Committee at Goodyear was ready to tell all. The radio told it that night on all three Akron stations. The newspapers told it, and the employees' magazine, "The Wingfoot Clan," announced:

"Today the figure 8 becomes the symbol of the greatest cause for which Goodyear Aircrafters ever have fought or ever will fight . . . It signifies the task of America's aircraft industry for 1942, as set by our Commander-in-Chief, President Roosevelt . . . There must be *one fighting plane every 8 minutes* in 1942 if America is to emerge victorious in our struggle for life."

Over the public address system in the plant a gong sounded every eight minutes thereafter. Two huge rallies near the plant on Thursday brought out thousands of workers to hear dramatic speeches by Army and Navy officers, company officials, and union officials. As the "pledge of the aircrafters" was read from the platform, the voices of thousands echoed it from the field. Thousands proudly wore an 8-ball pledge pin thereafter, and soon began to drop their suggestions into the boxes in every corner of the plant. A series of posters kept the 8-ball campaign rolling.

Named a Mascot

Little Mary Ann Mayers, pig-tailed and blonde, daughter of a Goodyear family just returned from the Far East, was made mascot of the continuing campaign. Mary Ann spoke at a rally. She exhibited shrapnel scars from Japanese submarine shells, and told a thrilling story of her family's escape from a sinking refugee ship. In subsequent posters she appears with messages like this:

"Dear friends: The work you do here at Aircraft will help the soldiers and sailors who helped me get away from the Japs. Please don't forget. Your friend and mascot, Mary Ann."

That's the way Goodyear brought the war home to its employees. If no Mary Ann is available, there are other ways. Northern Pump's Red Cross appeal was just one of a series of ads. Another was headed: "Can the Japs bomb Minneapolis?"

Feature of the ad is a map showing that the distance from Tokio to Minneapolis is about the same as the distance from Tokio to San Francisco. Best line of the copy is this:

"Yes, some peaceful Sunday morning a Rising Son-of-a-Gun may look down through his bombsight . . . *and see your home!* Remember Pearl Harbor! Remember Minneapolis! Buy War Bonds . . . and keep on buying them for the duration!"

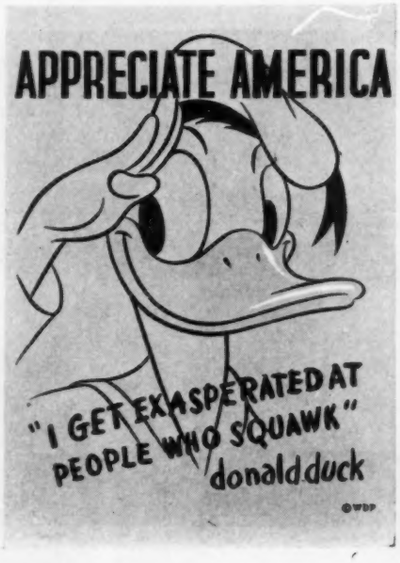
Northern Pump—a naval ordnance plant that whizzed up out of the ground into tremendous production in eleven months—can say with justice that its employees almost literally eat, sleep, and live "Production for Victory." Even the drinking cups are printed with Victory slogans. The Northern Pump campaign was one of the earliest to begin. President John B. Hawley, Jr., saw the need

Graphic waste chart at Crosley Corporation, Cincinnati, can be adjusted to the actual record of spoiled work. Committeemen view sign with interest

Worker at bottom of ladder will fry Jap with acetylene torch as soon as Crocker-Wheeler employees have turned in enough production-boosting ideas

In strategic plant locations this scoreboard reminds Packard Motor employees of "Work to Win" pledge

Pictures of fellow-employees in the armed services remind General Electric workers (above) that lives depend in their speed and skill. Poster (below, left) is one of series offered by Appreciate America, Inc., a non-profit institution at 130 N. Wells St., Chicago. Same group issues booklet titled "I Know My Stuff, Do You?" by Joe Doakes. Center poster is newest from WPB's War Production Drive headquarters. Red, white, and blue mobile bulletin boards (right) help sell War Bonds at Northern Pump Company



for it as early as January, 1941. Big and little signs and posters filled every department and plant, blazoning the message, "Blitz 100," short for "Blitz 100 Anti-Aircraft Guns Before Christmas." The quota was met three weeks before Christmas, six months ahead of contract schedule.

Northern Pump maintains constantly changing poster appeals, keeps dramatic scoreboards in every department, serenades employees with patriotic music, entertainment, and war bond announcements over the plant sound system during lunch periods, and decorates every vehicle in the plant with slogans.

Twins Win $1000

Door prizes, if you please, totaling $1250 made attendance on Saturday afternoon and Sunday shifts very popular. When the hundredth AA-gun was finished it was decorated like the proverbial Christmas tree and made the guest of honor at a brilliant ceremony at which a bottle of champagne was broken. An AA-gun is known as a "twin." So "The Navy Wants Twins" became a Northern Pump slogan. It didn't end there. A cellophane-wrapped baby carriage was displayed in the plant to announce a $1000 prize to be given for the first set of twins to be born to an employee of the company after a certain date. In about six weeks Mrs. John T. Barron, wife of a coffee maker on the night shift commissary, helped her husband collect.

Few companies have gone so far into the use of display material as Northern Pump. Its wrapping tape is printed with war bond slogans. There's a slogan under every telephone dial, and the slogan is, of course, "Time is Short." Even the cigarettes you buy in the plant are wrapped in special jackets bearing production slogans, and the matches, on the reverse side, tell a similar story.

The objective of "bringing home the war" appears more prominently in all the campaigns that have lately come to FACTORY's notice. The war news itself, naturally, helps in this. For example, the employee magazine of the United States Bedding Company, St. Paul, quickly seizes the opportunity to proclaim "Former King Koil Employee Sinks First Jap Sub!" Not every company is so fortunate as to have that much to boast about, perhaps, but nearly every major war contractor, and its subcontractors, can now point to some distinguished performance on the part of its product.

Not improbably the War Production Drive is about to move into a new phase of development and will doubtless spread to thousands of plants not currently involved. Such at any rate is the plan of War Production Drive headquarters of the War Production Board. Because the principles of such drives are now so firmly fixed, FACTORY has chosen in this article to concentrate on ideas and techniques.

The Goodyear and Northern Pump examples are especially rewarding as case studies. Booklets containing more detailed description may be obtained by addressing the companies.

Axis takes a real beating at Girdler Corporation, Louisville, where husky employees work off steam by cuffing the punching bag

Workers gave their employers a medal at American Car & Foundry's Philadelphia tank plant. It all began when ACF's "Soldiers of Production" donned insignia of their own in the form of small silver replicas of tanks. Then they decided to take up a collection and have gold models made for Charles J. Hardy, president, and three senior officials. Each worker put in a penny apiece. Below, two stalwart CIO committeemen (left) push a pile of pennies into the collection

Load Charts Show Up Production Bottlenecks

Knowing what loads will be in each department — as these submarine builders do — helps to schedule balance production, and meet delivery promises

A. N. DEDRICKS, Production Engineer, Manitowoc Ship Building Company, Manitowoc, Wis.

FOREMEN ARE NOT MAGICIANS. They can only turn out 24-hours' work in 24 hours. If a foreman is seven days behind in his orders, and additional orders are continually being given him to complete current jobs, which should he take first? He probably would like to finish the oldest orders, but a certain portion of the current ones are "rush," and instructions come from the office to hurry this and push that. In a few weeks some orders get to be three to four weeks behind. How then can the production department expect the foreman to meet any of his dates? It is evident that no importance has been attached to them, or he would not have been allowed to get so far behind schedule.

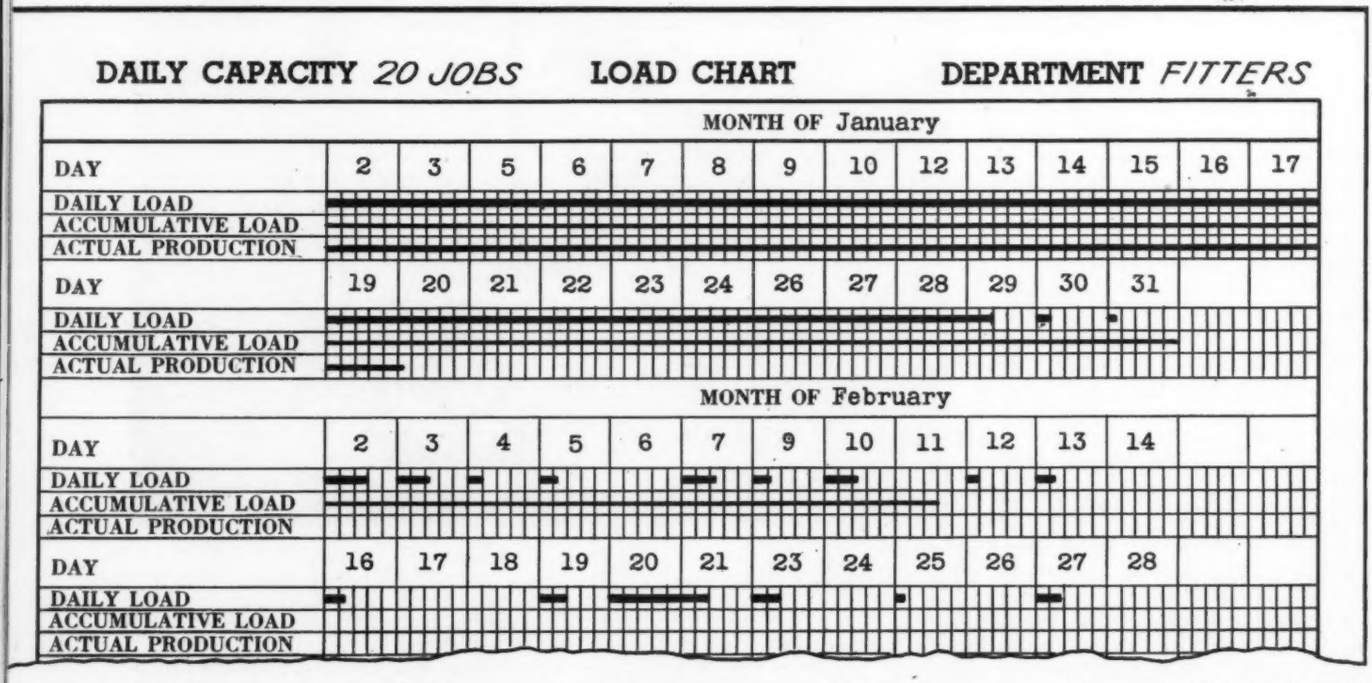
If a production bottleneck is in the offing in some department, how can it be determined in advance, rather than have it suddenly become a serious obstacle nobody dreamed could ever happen?

What assurance can we give management that all jobs will be completed on schedule, with a reasonable degree of accuracy?

How can we make a production system work? We found the answers to all these problems in load charts. These charts may vary in size and design to suit conditions in the plants in which they are used, and they can be made to tell various types of stories.

We are building the most complicated boat in the United States Navy. We had built many boats before, but never submarines. When we started we did not have time standards or any method of obtaining them, so a load chart based on hours was out of the picture in the hull-fabricating de-

Figure 1. This sample load chart is based on a department capacity of 20 jobs per day. Each of the five squares within the day has a value of four jobs. To get the accumulative load required adding all the daily squares, or portions thereof, and plotting them in one line in the accumulative column


DAILY CAPACITY 20 JOBS
LOAD CHART
DEPARTMENT FITTERS
MONTH OF January
DAY 2 3 5 6 7 8 9 10 12 13 14 15 16 17
DAILY LOAD
ACCUMULATIVE LOAD
ACTUAL PRODUCTION
DAY 19 20 21 22 23 24 26 27 28 29 30 31
DAILY LOAD
ACCUMULATIVE LOAD
ACTUAL PRODUCTION
MONTH OF February
DAY 2 3 4 5 6 7 9 10 11 12 13 14
DAILY LOAD
ACCUMULATIVE LOAD
ACTUAL PRODUCTION
DAY 16 17 18 19 20 21 23 24 25 26 27 28
DAILY LOAD
ACCUMULATIVE LOAD
ACTUAL PRODUCTION

"Daily capacity" is average daily production of department. "Daily load" is the number of jobs scheduled in accordance with capacity. "Accumulative load" equals total or accumulation of all daily loads to show total amount of work scheduled ahead of department and still to be performed. "Actual production" is the actual performance recorded on Saturday of each week showing performance in comparison with scheduled production. This acts as a balance wheel, shows any increase or decrease in capacity due to fluctuation in manpower or hours, and enables the production department to alter capacity to suit production

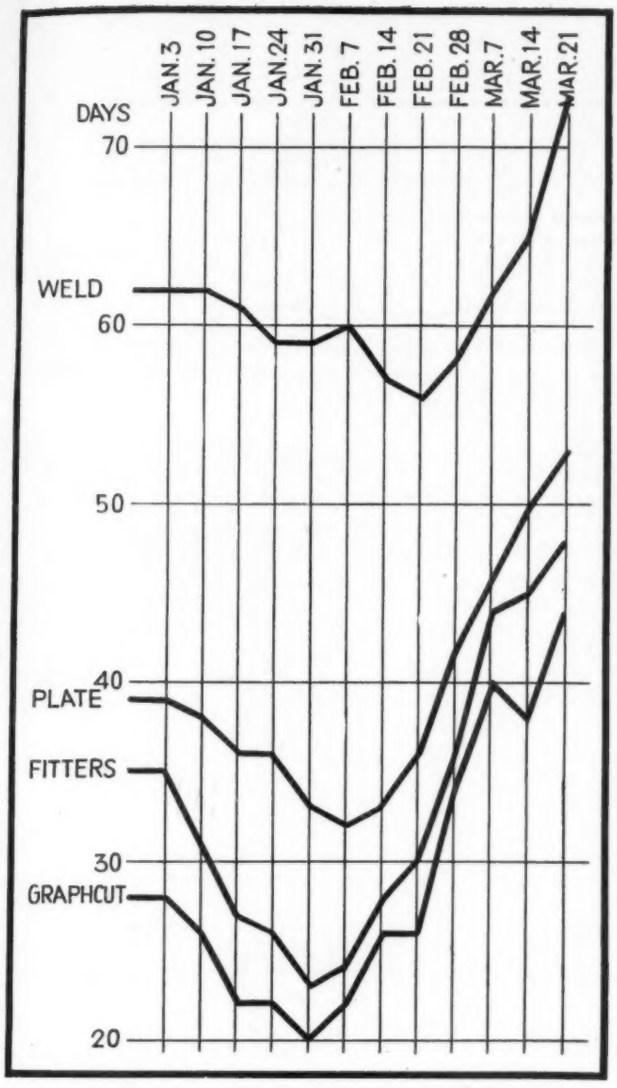


Figure 3 (left). Once each week the amount of work scheduled for each department is posted in graph form, so that the total can be seen at a glance

Date JAN. 7-42

LOAD CHART PICTURE

	Do not schedule before
MOLD LOFT	FEB. 11
TEMPLET	FEB. 3
FITTERS	JAN. 29
PLATE	FEB. 6
GRAPHCUT	JAN. 27
WELD	FEB. 26

Figure 2 (above). First thing each morning the man in charge of the load charts fills out this form, and puts down the first open date for each department

partment. However, our type of production system offered an alternate. We issued job tickets to the various departments on the days the jobs should be started, so we decided to keep track of the number of job tickets turned in, showing completed jobs each day. The value of the work on each job ticket might vary considerably, but we figured that after several weeks an average would prove to be fairly accurate.

At the end of 30 days, we averaged each department. If a department averaged 23 jobs per day, we set its capacity at 20, for two reasons:

1. Our average was for a period of only 30 days. We wanted to play safe and not overschedule any department and thereby give it a reason for falling behind.

2. We wanted to reserve a margin of safety, so that we could squeeze in those occasional rush jobs that always have to be given preference.

Our next step was to pick up our present load. This did not present any great problem, as it merely meant adding the various job tickets that had not been issued to each department, and then plotting them on the basis of the estimated capacity we had figured from the averages of production for the past 30 days.

We wanted our load charts to tell us three different stories:

1. Daily load (the amount of work scheduled for each day.

2. Accumulative load (the accumulation of all daily loads).

3. Actual production (what was actually being produced).

The sample load chart (Figure 1) is based on a department capacity of 20 jobs per day. Therefore each of the five squares within the day has a value of four jobs. The daily load was plotted on this basis. To get the accumulative load required adding all the daily squares or portions thereof, and plotting them in one continuous line in the accumulative column. This told us that if we did not issue another job to that department, it would have just so many days' work before its production would cease.

The actual production column is our barometer. It tells us whether a storm is brewing or clear weather is ahead. Each week at the completion of Saturday's production, we add the job tickets turned in by each department and plot them in a continuous line in this column. If, on the basis of 20 jobs, a total of 120 jobs are turned in for six days' production, we are in perfect balance.

However, the main story we want this column to tell is the variation in production because of increased or decreased capacity. If the increase is permanent, we can increase our capacity from 20 to 25. If, because of shortage of materials, production has been decreased, we can reduce our capacity. Each week, at the end of

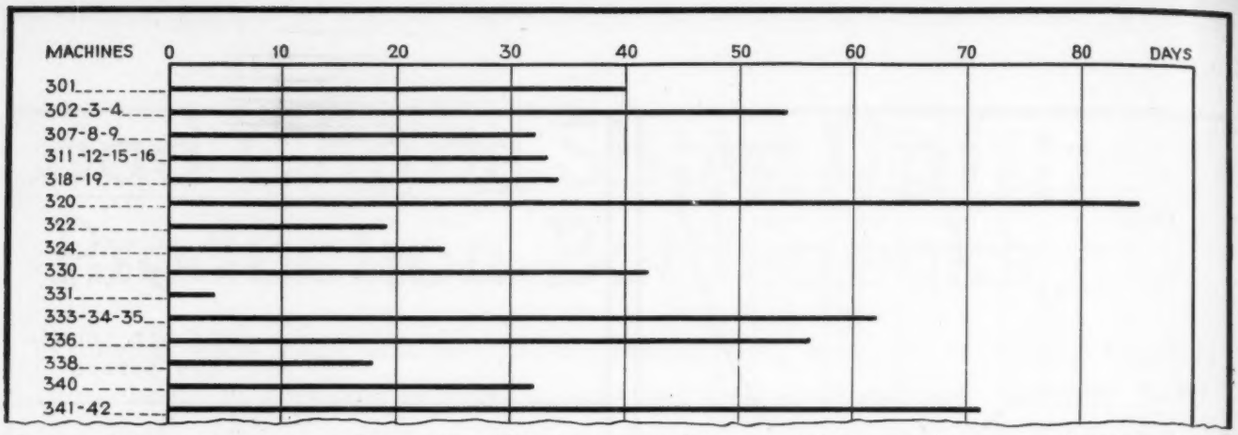


Figure 4. A graph for the machine shop. This form was prepared to show the picture of all the machines in relation to the accumulated load. If one is overloaded, perhaps another can help

the line posted in the actual production column, we insert the date, so that we can tell at a glance the number of jobs ahead or behind schedule. If a department is three or four days behind, it is easy to close up the first three or four open days in the daily load column. This might be a week or two ahead, but it assures us that we are giving the foreman a chance to get back on schedule.

Once each day we accumulate the job tickets made out for each department, and separate them by days. They are then posted to the daily load in accordance with their schedule dates. The tickets for each department are totaled, giving us the amount to add to our accumulative line.

In some departments, such as the mold loft and templet department, we have found it possible to change our procedure somewhat. Instead of basing our load on jobs, we base it on individual molds for the mold loft and individual templets for the templet department. This is a finer division than loading jobs and gives us greater accuracy. The rest of the procedure remains unchanged.

The machine shop offered still another possibility for load charts. All items going through the machine shop were first estimated, and time values were established for each separate operation. Thus we were able to set up a machine load as follows:

1. All machines of a similar size and nature were grouped. Capacity was figured as the combined output of the entire group. Thereby we eliminated setting up an individual load chart for each machine. Furthermore, with small-quantity runs it would be practically impossible to route items to individual machines with any degree of efficiency.

2. Capacity was then figured on the basis of 24 hours per day, multiplied

(*Continued on page 198*)

A Safe Plant Is a Productive Plant

A. F. ERICKSON, **Works Manager, All-Steel-Equip Company, Inc., Aurora, Ill.**

HERE ARE 26 SIMPLE SAFETY rules that can be applied in any company, small or large.

1. Insist that operators wear proper clothing and omit rings.
2. Sell foremen on the safety idea.
3. Let each employee know that management approves safety practices.
4. Inaugurate an educational program to secure employees' cooperation, especially new employees.
5. Impress on every employee the value of safety.
6. Do not allow operators to oil machinery in motion.
7. Discourage unnecessary conversation and "visiting" while operating.
8. Insist on the use of the safety equipment provided.
9. See that foremen's instructions are followed.
10. Impress on workmen the necessity for exercising prudence.
11. See that floors are kept in good condition.
12. Be sure that necessary guards are installed.
13. Be sure that first aid is rendered, even for minor accidents.
14. Insist on good housekeeping.
15. Watch for proper loading of skids—be sure they are not overloaded.
16. Look out for any defective machinery.
17. Do not allow the use of mushroomed tools.
18. Do not allow belts to be shifted by hand while machines are in motion.
19. See that hands are kept out of dies during set-up.
20. See that proper extensions are installed on punch presses.
21. Do not allow gages to be measured or set while machine is in motion.
22. See that hand tools are inspected and repaired regularly.
23. Have cables, hoisting, and lifting equipment inspected periodically.
24. Teach respect for employer's property.
25. Give proper instructions on how to lift.
26. See that safety instructions are followed up.

It is the responsibility of the safety engineer to stress the importance of giving proper instruction to workmen on safe practices and hazards; and to maintain constant inspection of safety equipment and see that rules are obeyed.

The superintendent should emphasize good housekeeping (orderly arrangement of plant, machinery, and factory equipment); promote application of safety equipment, and insist on its proper use.

Foremen's duties include teaching the correct use of tools and equipment; insisting on right clothing, personal equipment, and so on.

The individual workmen's responsibility is his application and concentration on the work in hand.

Large, antiquated machines of one kind or another are broken with huge metal ball. Railroad crane magnet poises ball above machine to be broken. It repeatedly drops and picks up ball

Winning the War on Waste

CONSERVATION IS AN ART about which industry in general has known little. Saving materials, salvaging waste, never seemed quite worth the effort. But today company after company is learning—the hard way—the importance of every piece of metal, every bit of scrap.

At Canton, Ohio, for example, The Timken Roller Bearing Company has set up a conservation department which has a single job to perform—saving materials to help win the war. Waste oil, which had been escaping into the city sewage system, is reclaimed and sold. A new method of cementing high-speed steel tips on carbon steel shanks reduced high-speed tool expense 75 percent in a year.

Discarded grinding stones, previously junked, are cut down to smaller sizes and used on higher geared spindles. When they can no longer be used they are broken and the lead centers are reclaimed for use in making lead mallets. Old firebrick is ground up and made into high-temperature cement for use in the melt shop. Company wastebaskets yield nearly 12 tons of paper a month.

Solder is salvaged by melting it from the ends of electric cable lugs. Lugs are sandblasted and stored for re-use. Discarded cables are washed in an oil solution at 300 degrees Fahrenheit, carefully inspected, and sent back into service—or used in shorter lengths or on less exacting jobs. Pipe valves are carefully disassembled, repaired, and placed in stock for further use. Old, greasy belting is washed carefully, resurfaced, and re-used. Discarded electrical switch boxes are inspected, repaired, painted, and re-used.

Shown in the pages that follow are only a few of the ways in which Timken's conservation department is not only helping the war effort but also decreasing the company's need for new materials—those materials that are of such vital importance today.

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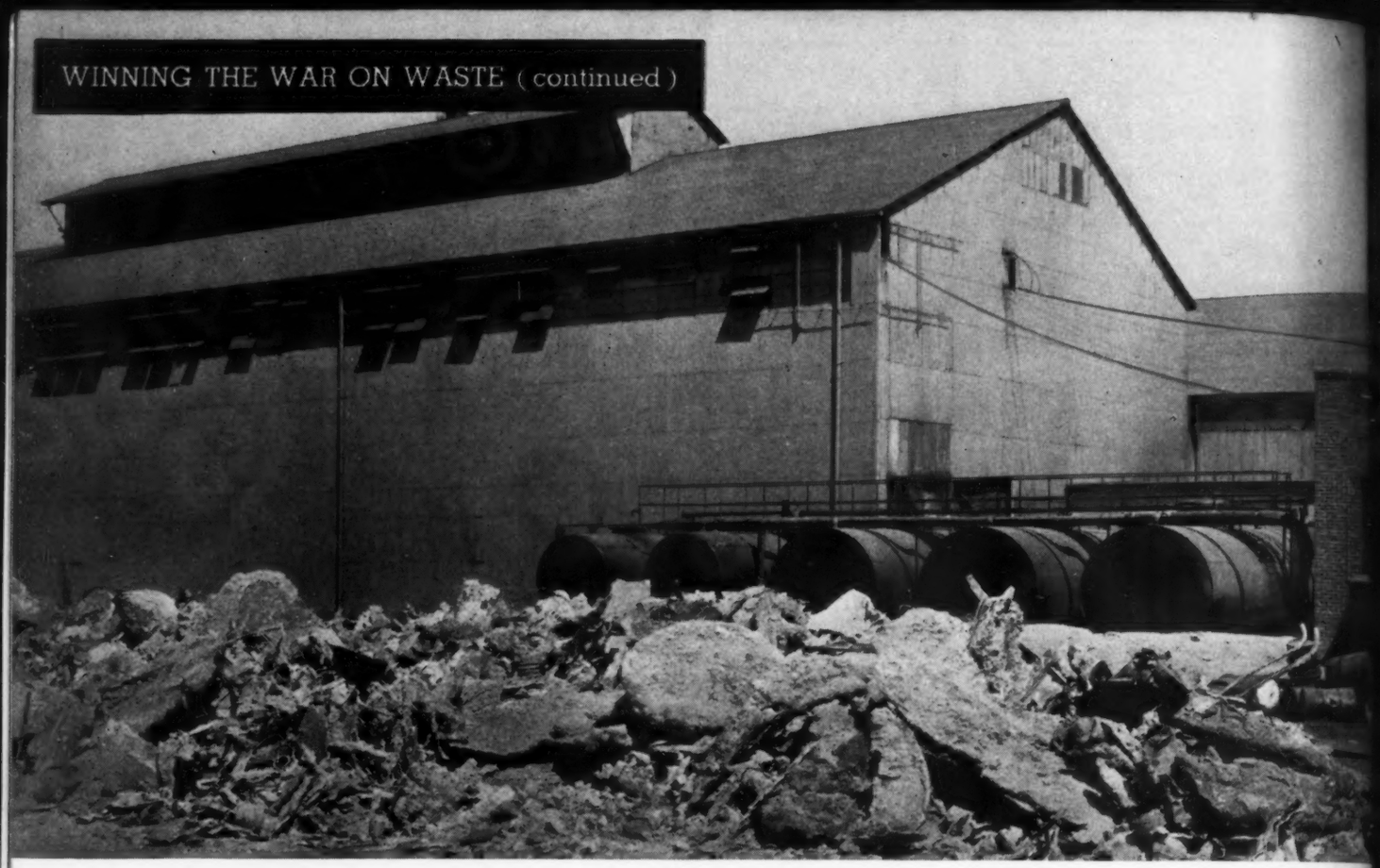
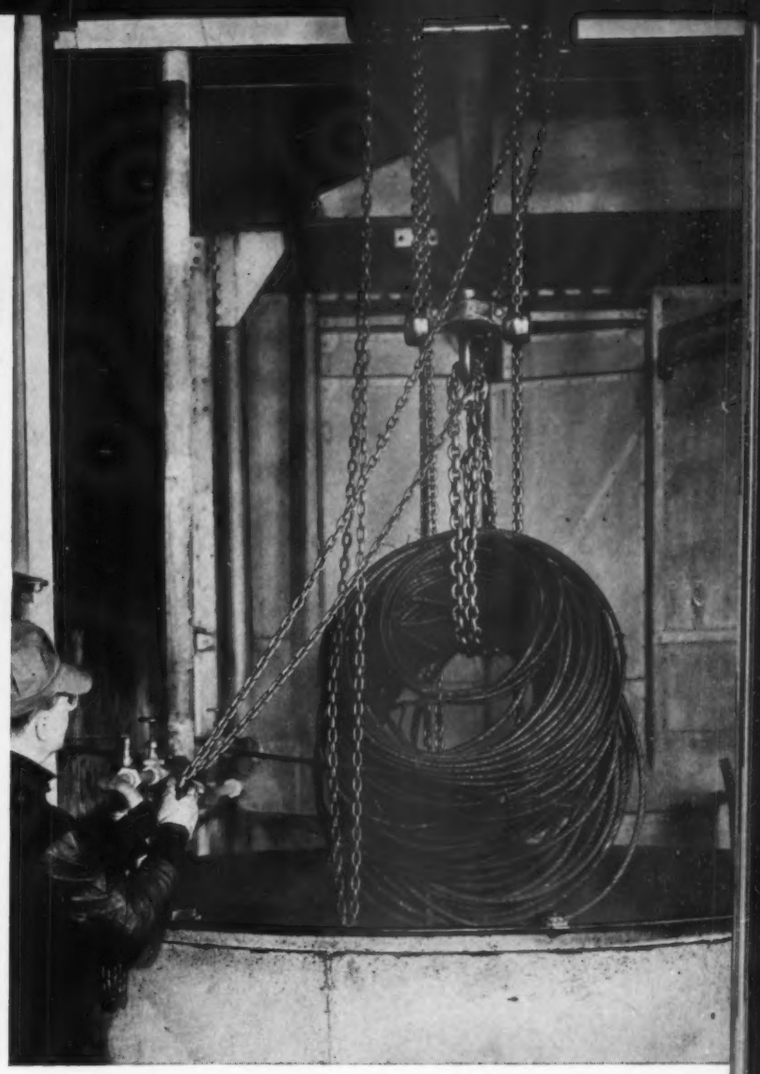


These steel "skulls" were thrown on steel mill scrap pile years ago. Taken from thimbles and floor of melt shop, they contain considerable foreign matter, but enough steel to make them worth remelting today. Power shovels have dug these from steel mill dump; now they are assembled for delivery to melt shop. Old electric furnace carbons in foreground will be ground up and used in carbon additions to steel. Such salvaging decreases the company's need for vital new materials

Even discarded grinding wheels are compelled to give further service. Their lead centers are removed, melted, and cast onto the end of short pieces of pipe to make lead mallets

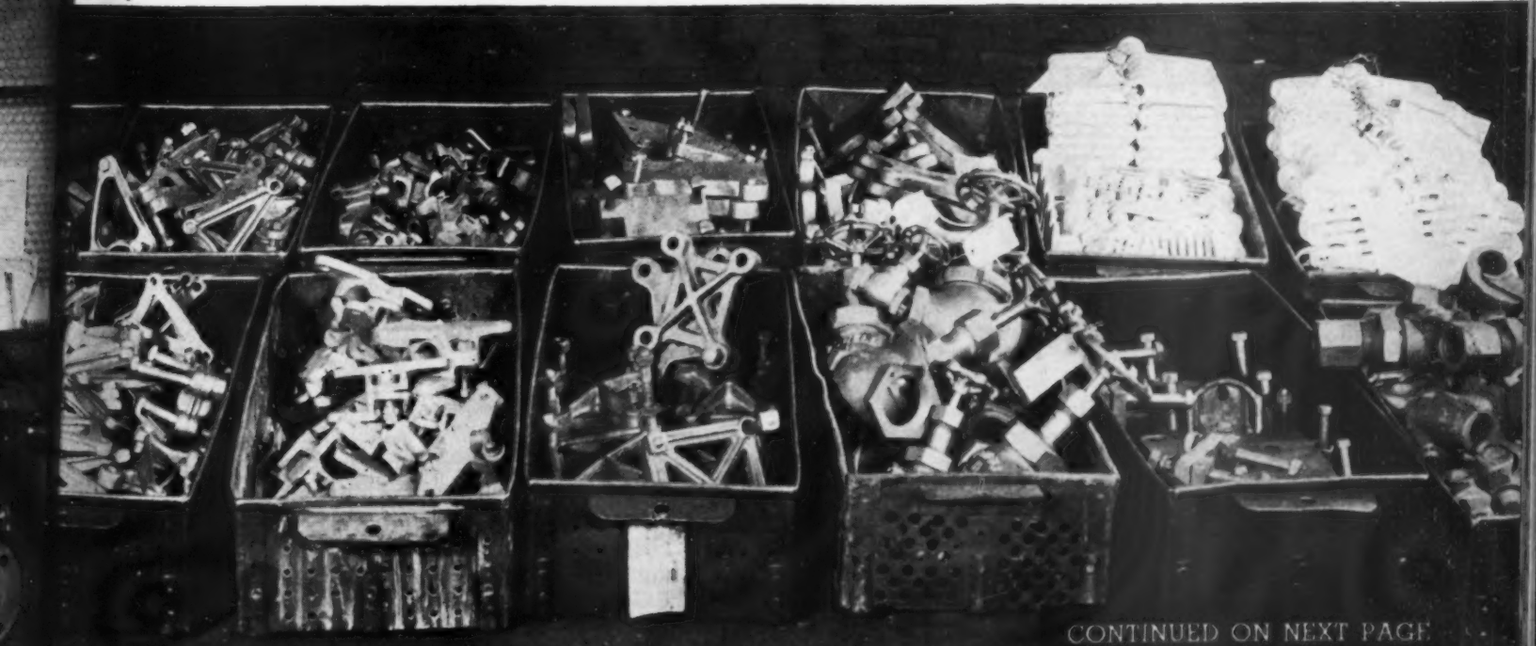
One workman spends his entire time disassembling, inspecting, and repairing old valves. Scarce and valuable as time and labor are today, metal is even scarcer and more valuable

These bright "new" electric bus terminals were scrap only a few days ago. It was a comparatively simple job to melt off the old solder, then sandblast and sort them for re-use. The solder is cast into bars and re-used also. Nothing is wasted at Timken



Nothing looks more unlovely and worthless than a mess of snarled, greasy cable. Timken makes a regular cable round-up, washes it thoroughly, inspects it, and sends it back into service. Damaged cable is sold as scrap. Short lengths make slings

Shiny as a new dollar and all ready for wartime service, these salvaged electric bus connectors, valves, and so forth, are arranged neatly in pans on the salvage room floor ready for the stockroom



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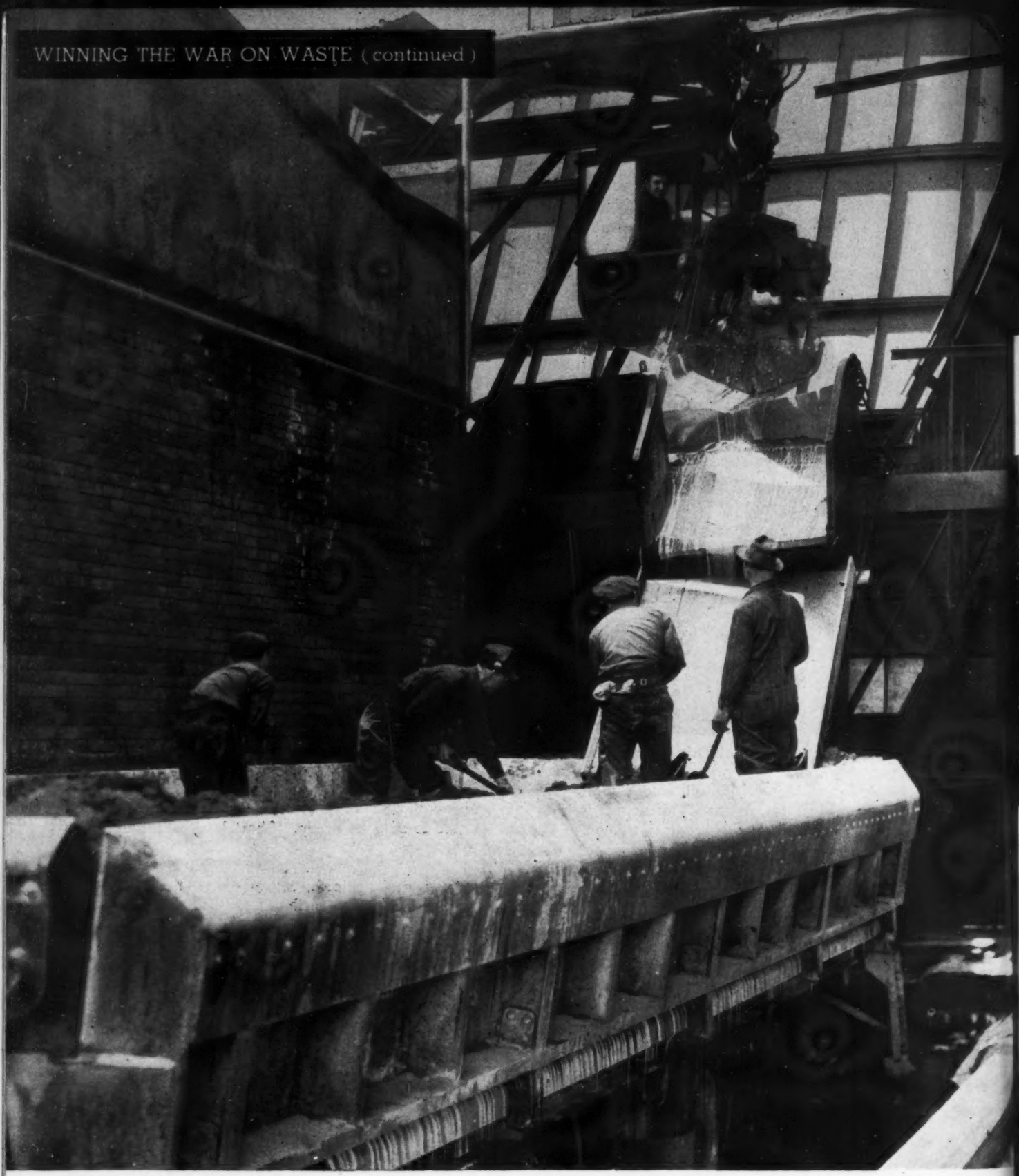

Bearing manufacture consists largely of grinding the cups, cones, and rolls to size. Only a small amount of metal can be removed at one time to assure accuracy of tolerances which are held to less than the thickness of a human hair. Consequently this metal is taken off in almost microscopic particles and is a part of the dirt and oil sludge which collects beneath each grinding machine. For years this sludge was regarded as being entirely useless and was "dumped." Recent analyses disclosed that this sludge contains as much as 80 percent steel which can be reclaimed in blast furnaces. Here workmen are loading one of the two or three carloads now salvaged each week

Girl in foreground (left) has a sorting bench full of high-speed steel that is almost worth its weight in gold these days. This steel contains such critical materials as chrome and tungsten. The larger pieces will be shaped up, cut to size, and cemented onto medium carbon steel cutting tool shanks. Timken, by this method, has effected a saving of more than 75 percent of former high-speed tool steel consumption. Leather belting (right) is washed and inspected, resurfaced, repaired, and re-used

Every department has a complete set of scrap segregation cans, thus making metal sorting an automatic feature of Timken's scrap collection program. Cans are emptied regularly into central bins

Valves of all kinds are assembled from the dump for repair and re-use. At one time easily replaced, they were consigned to the scrap pile when extensive repairs were required. Present emergency has warranted collection, repair, and re-use

Even rusted, discarded electric switch boxes are being called back into service. These have been thoroughly inspected, repaired, and cleaned, and are now waiting to be painted—after which they will be placed in stock for re-use

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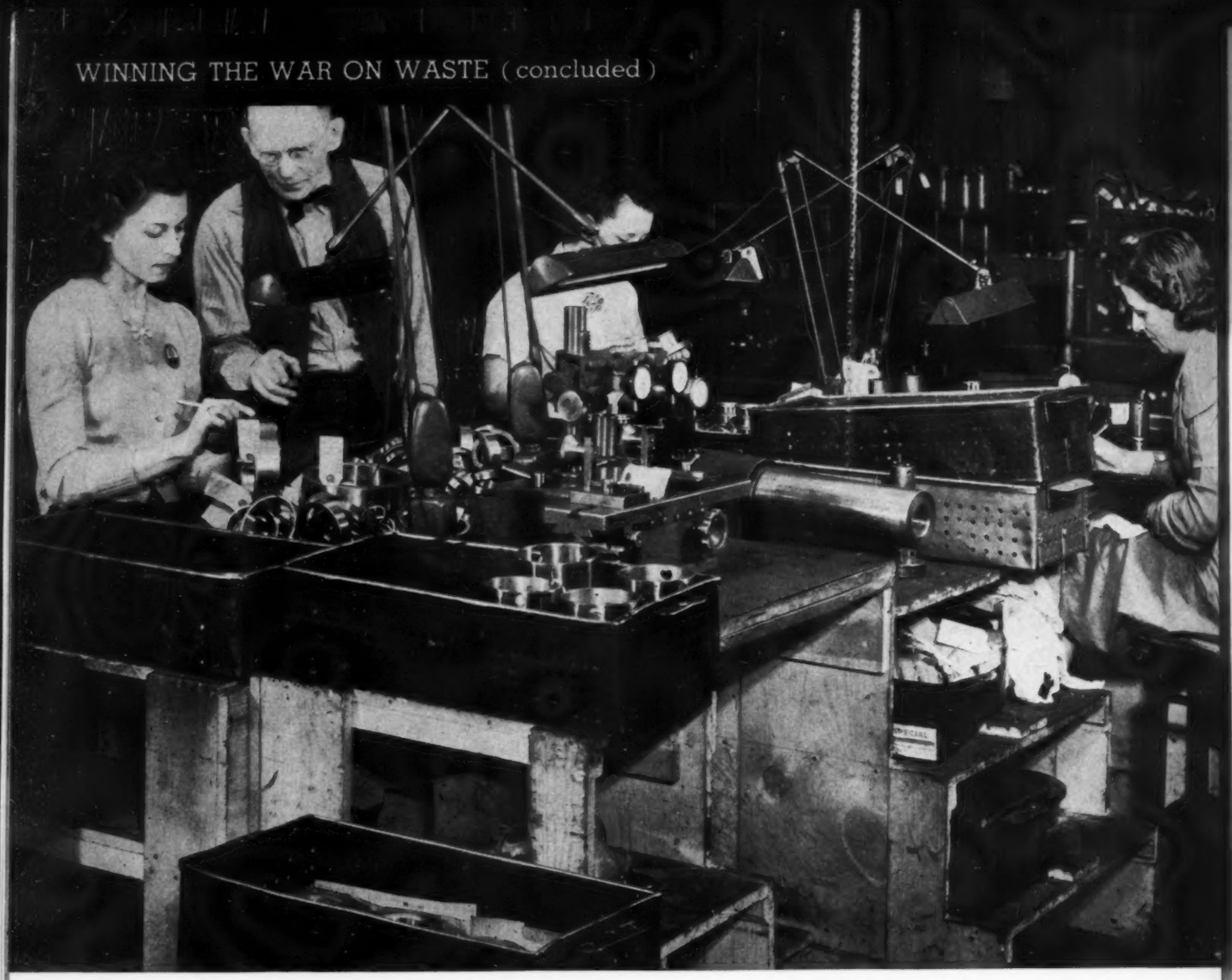
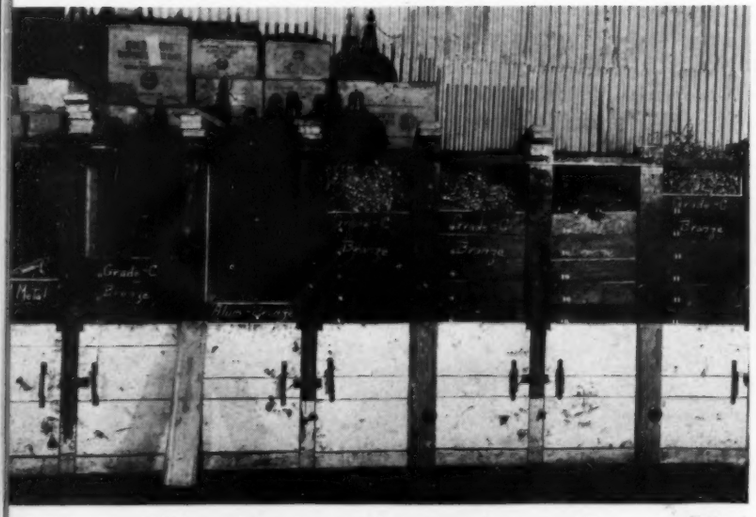


Every effort is made to use salvaged materials in their original form. If this is impossible, they are reworked and adapted as quickly and easily as possible. These girls are checking scrapped tapered roller bearings to see if they can be used on some less exacting job



When these central scrap storage bins are filled to capacity, a local scrap dealer empties bins to make room for more scrap. Front sections of bins consist of heavy tongue-and-groove boards

Obsolete, damaged, and badly worn plant railroad equipment that cannot be used without extensive reconditioning is cut up and sent to furnaces for remelting, as is also experimental equipment

Significant Labor Developments

Period surveyed: May 10 to June 10

TREND INDICATORS

Supreme Court Sanctions Limit on Overtime

THE SUPREME COURT UPHELD, in a five-to-four decision, the long litigated plan of the A. H. Belo Corporation to make individual contracts with employees whose hours are irregular, under which the employees receive a fixed sum in pay each week, although they work in excess of 40 hours in some weeks.

The contract guaranteed the employees $40 a week, but the basic pay was fixed arbitrarily at 67 cents an hour for the first 44 hours, with time and a half after that. As the statutory hours diminished, the weekly guarantee covered 42 hours, and then 40 hours.

The Wage and Hour Administrator ruled that it was not fair to use 67 cents an hour as an arbitrary divisor before computing overtime. If a man worked 50 hours a week, he declared, the hourly wage would be the $40 weekly salary divided by 50, the number of hours worked. This would give him 80 cents an hour for the first 40 hours and $1.20 an hour for the remaining 10 hours, or a total of $44.

By the arbitrary divisor of 67 cents the man would receive pay for 40 hours at 67 cents and then pay for 10 hours overtime at $1 an hour, or a total of $36.80. Thus no payment over the $40 weekly guarantee would be made for 10 hours overtime.

In the Overnight Motor Transportation Company case the company claimed that it need not pay time and a half for overtime if the employee's weekly pay amounted to as much as 40 cents an hour for straight time and 60 cents an hour for overtime. The Court, with Justice Roberts dissenting, ruled that the overtime provision of the law required the company to pay 150 percent of the "regular, not the minimum wage."

Employer's Release Held Worthless

The court asserted that such a release was easily procurable, since the employee would be bound to give it if he desired to continue his employment; but characterized such release worthless as a means of protecting the employer against a suit for unpaid wages and damages. (Hutchinson vs. William C. Barry.)

Intrastate Activity, but Under Wage-Hour Act

Even though a firm does not itself engage in interstate commerce or produce goods for commerce, it may be subject to the Wage-Hour Act where its employees contribute to the interstate operations of other companies. This is illustrated in the case of maintenance and clerical workers employed by a firm engaged in servicing and repairing machinery. While almost all the service and repair work is done inside the state, the Wage-Hour Act applies, since the company's customers were manufacturers of goods, sold in interstate commerce. (Holland vs. Amoskeag Machine Company.)

Injunction Must Be Restricted

Even though an employer had ceased violating the Wage-Hour Act before suit was filed against him he is still liable to injunction, but the injunction must restrain specific violations. In the particular case, the injunction forbade any violation of the Act whatsoever. Since failure to obey the injunction subjects the offer to punishment for contempt of court, the Circuit Court of Appeals ruled that injunctions should be narrowly phrased. (Fleming vs. Jacksonville Paper Company.)

Wage-Hour Act Extended to Maintenance Employees

As a result of the recent Supreme Court decision in the Kirschbaum Building Company case, thousands of persons engaged in activities hitherto considered clearly intrastate, and therefore outside of the scope of the Fair Labor Standards Act, have now been brought within its purview.

Under this decision, a worker does not have to come into bodily contact with the goods that enter interstate commerce in order to be covered. If the employee is closely, although indirectly, connected with goods produced for interstate commerce he comes under the protection of the Act. This decision brings under the Act a wide variety of service concerns, hitherto considered exempt.

For example, if a utility company whose power is sold wholly within the confines of one state has among its customers a manufacturer who produces for interstate commerce, employees of the utility can be said to come under the Wage-Hour Act.

Employer Penalized for Accepting

For accepting a kickback an employer was compelled to make restitution—pay an equal amount as liquidated damages, interest, and attorney's fees—a total of over $3000. (Schneider vs. Sports Vogue, Inc.)

Premium Pay To Be Reflected in Rate

The payment of an additional 5 cents an hour for night work pursuant to a union contract for work in excess of 8 hours a day or 40 hours a week was ruled not to be overtime payment, but a premium for the night work.

Hence, in estimating overtime the employee was to be considered as being paid two different rates, the day rate and the night rate. Overtime is, therefore, to be computed by dividing the weekly earnings at both rates by the total number of hours worked during the week.

Highest Wage and Hour Standards Prevail

The Wage-Hour Act does not supersede a state law which bars absolutely the employment of women for more than 8 hours a day or 48 hours a week.

Employees covered by both laws, under a ruling of the Solicitor of the Labor Department, must be paid time and a half for all hours in excess of 40 a week, but, in accordance with the state statute, may not under any condition work longer than 8 hours a day or 48 hours a week.

Where two laws overlap, the ruling notes, the higher standard prevails.

Injunction Sustained Where Management Uncooperative

An injunction was sustained against an employer even though he ceased violating the Act when it was found that compliance with the Act was

(Continued on page 200)

Case Studies in Work Simplification

SHOWN IN THESE THREE picture pages are actual problems brought by practical methods men to a summer course at the University of Iowa, and solved in that institution's motion study laboratory. This material was submitted by Ralph M. Barnes, professor of industrial engineering and director of personnel, College of Engineering, University of Iowa.

The course lasts three weeks, attracts foremen and supervisors from all types of plants. They are taught to apply time study principles to specific problems, and they go back to their jobs ready to use the knowledge they have gained, and to pass it on to others.

Lessons are given for eight hours each day, but the men usually discover that time to be too short, and organize their own evening sessions to give further consideration to the material that has been presented during the day.

Photographs are reproduced here to illustrate the possibilities for savings in almost any plant through practical application of motion study principles and a little ingenuity.

WINDING TAPE ONTO PAD

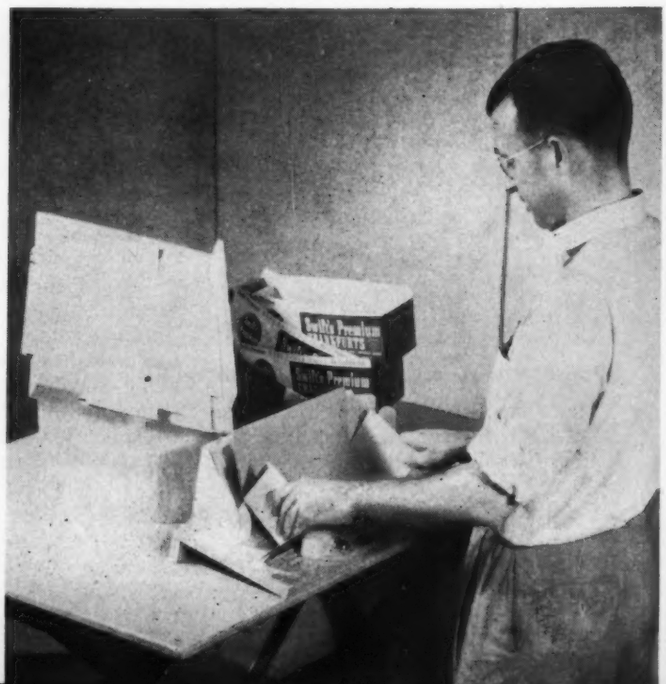
OLD METHOD. Strip of tape had to be wound around a form held in the left hand. This operation was inefficient as well as tiresome

NEW METHOD. A simple foot-operated winding fixture freed the left hand for productive work and reduced fatigue. Output increased 156 percent

FOLDING PAPER CARTONS

OLD METHOD. Packages of eight flat cartons were broken at seams to facilitate folding. Then one end of the carton was folded, the carton was turned around, and the other end folded

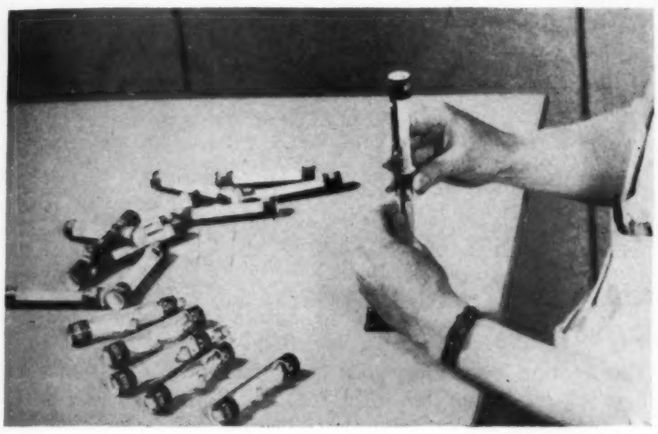
NEW METHOD. A wooden fixture was designed and built. Flat cartons were placed in the fixture one at a time, and both ends folded at once. Both hands were used. Output was doubled

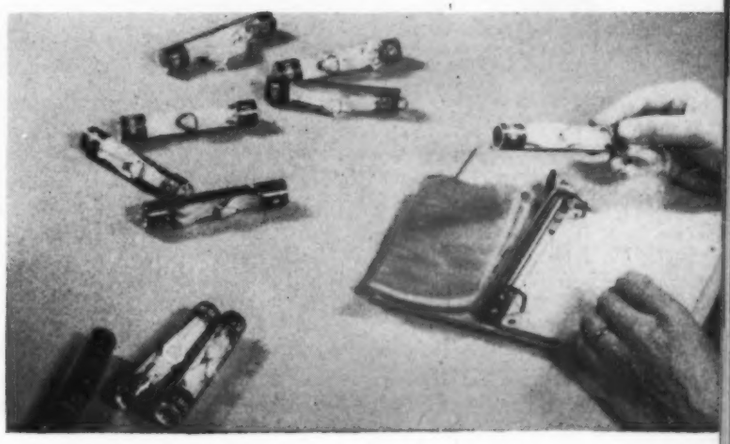


ASSEMBLING REFRIGERATOR ICE TRAY GRIDS

OLD METHOD. Sixteen small parts were assembled one at a time. The right hand worked, while the left hand was doing nothing but hold. Even though parts were pre-positioned, method was impractical

NEW METHOD. Wooden fixture with guide strip at the front and back, and with two blocks nailed to the bottom to hold the center aluminum grid, permitted two hands to work. Increase, 36 percent





PACKAGING TAPE BELTS

OLD METHOD. First operation was to fold belt over vertical guide, assemble tube over both guide and belt, withdraw belt and tube from guide

Second operation was to wrap tube in cellophane, tuck the cellophane in the ends of the tube, touch tube against hot iron to seal cellophane

Third operation, placing 24 tubes in carton, inserting cardboard disk in end of each tube, closing end of carton, turning carton over, opening it, inserting disk in other end of tube, closing carton

NEW METHOD. Tape belt inserted into tube. Tube cellophane-wrapped with aid of fixture. Foot-operated iron sealed wrapper. Cellophane tucked in and disks inserted with both hands. Saved, $2600

CONTINUED ON NEXT PAGE

PACKAGING SCREWS, NUTS, AND WASHERS

OLD METHOD. Screws, nuts, and lock washers were counted out into envelopes and put into trays

The second operation was to moisten the gummed flap of the envelope and then seal the envelope

NEW METHOD. Bins and fixture were designed and built. New method used simultaneous, symmetrical motions of the two hands, permitted sliding of parts instead of "pick up and carry," eliminated the time formerly used to moisten envelope flaps. Output was increased 49 percent

Fewer Clerks Make Up More Payroll in Less Time

Slotted-card system enables three clerks to make up a weekly payroll for 850 employees and have checks ready for distribution three days after the work week ends. Better records and closer control of labor costs are byproducts

D. M. OLSON, Chief Accountant, La Crosse Rubber Mills Company, La Crosse, Wis.

IN THESE DAYS of disrupted production schedules, priority orders, and war contracts, one of the biggest problems confronting factory office management is keeping up with production, new employees, new rates, and greater earnings through the medium of payroll procedures. This fact is especially true of the small and medium-sized organizations, many of which for the first time in years are faced with greater production demands and, as a result, increased number of employees and higher payrolls.

A disadvantage accruing to an effective solution of increased payroll work, as far as the medium-sized company is concerned, is that in most instances the increased clerical work involved does not warrant the installation of expensive office machinery to absorb the load. Our company was faced with this problem, but I believe that we have solved the problem adequately and permanently, with a saving to the company through reduced clerical costs and through more complete and accurate records of labor costs.

Our company employs about 850 employees who are paid weekly. Before the installation of the new system, the payroll department employed six clerks, but the employees' checks were never ready for distribution before the last day of the week following the end of the work week. The payroll is now prepared by three employees, and the checks are ready for distribution the third day following the end of the work week.

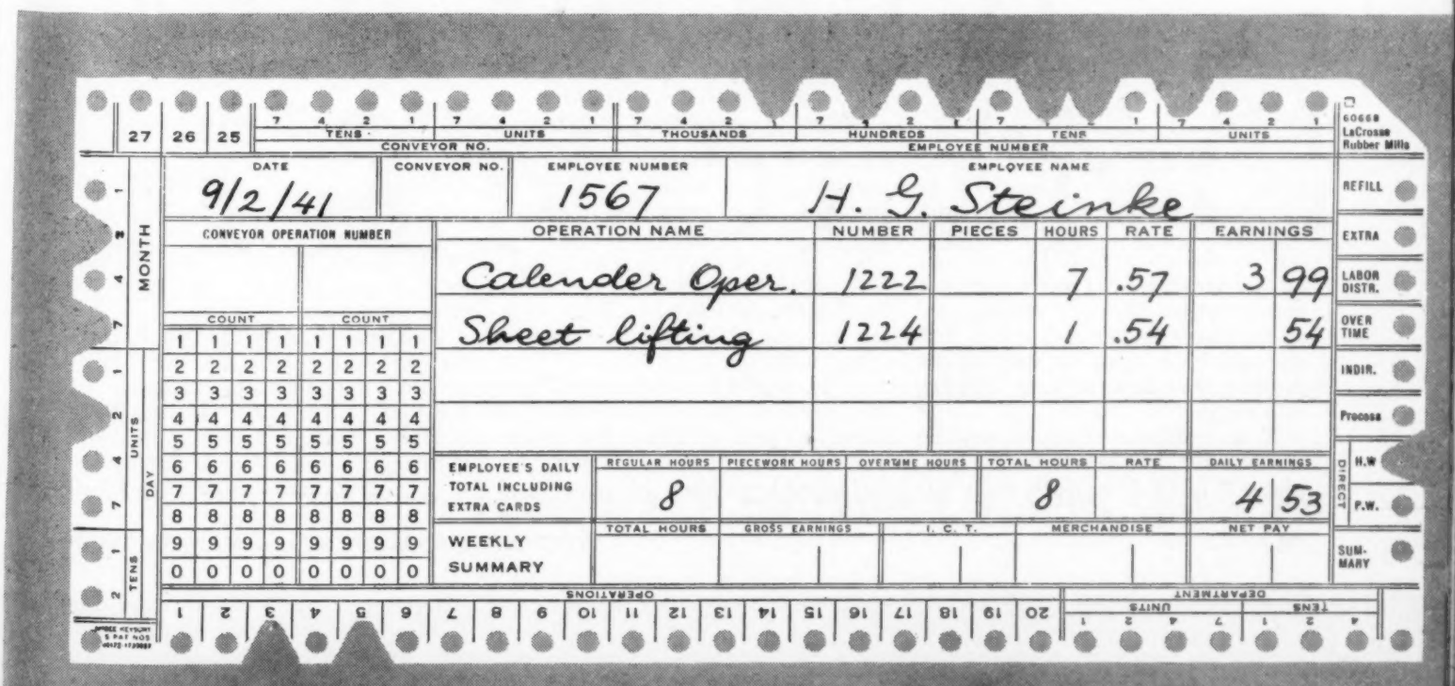
More Than 100 Accounts

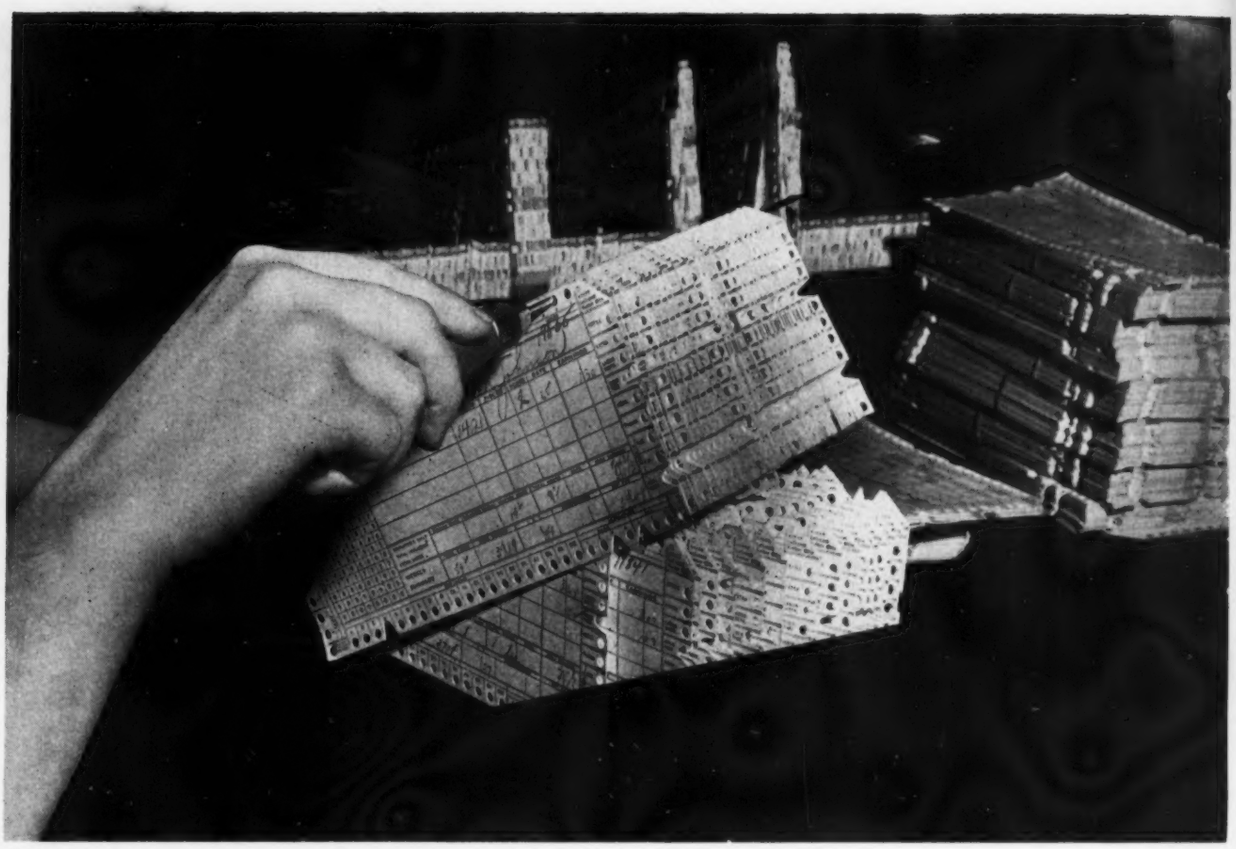
At the same time, a complete cost-accounting system was installed, and the payroll department now has over a hundred labor-distribution accounts to prepare weekly. The medium of data accumulation is a pre-printed time card designed for manual sorting.

Pads of 14 cards with the fourth from the last card slotted as a re-fill card are made up for each employee. On the back of the last card of each pad are written the employee's name and number. All the cards in the pad are slotted on a grooving machine for the employee's number and the department number in which the employee is regularly employed. These pre-slotted pads are then placed in the time clock rack, heretofore used as employees' clock card racks. Pads of cards slotted as "extra only" are supplied to the department foremen.

The card can be sorted manually—that is, by using a long needle which fits snugly in the holes on the edge of the card. It will be noted that the figures 7, 4, 2, 1 appear regularly on the card, because these numbers afford the greatest possible combination of figures. For example, to punch an employee's number of 1567 the fol-

Employee picks his card from the time clock rack, stamps time in on the back when he reports for work in the morning. His number and department number are slotted along the edge. He enters name and number of each operation performed. At night, the card is punched on the clock for time out





Cards can be sorted manually by inserting a long needle which fits into the holes along the edge

lowing procedure is used: In the space marked "thousands" the hole above number 1 is slotted; in the space marked "hundreds" the holes above 4 and 1, the total of 4 and 1 being 5; in the space marked "tens" the holes above 4 and 2, the total being 6; and in the "unit" section the hole above the 7 is slotted.

By arranging the series of 7, 4, 2, 1 as described, it is possible to have a figure of 9999, a degree of elasticity that will ordinarily be sufficient for any organization.

To insure daily accuracy in the payroll department, group block controls are set up for each hundred employees, as well as a total control for all such groups—for example, No. 1 block control for employees numbered 1 to 99, No. 2 for employees numbered 100 to 199; No. 3 for employees numbered 200 to 299, and so on. Each day's earnings by groups of 100 are entered on the block control sheet. On the master control the total earnings for all the employees are entered for that day, and must equal the total of the detail as posted to the labor distribution for the day.

As an employee reports for work he removes the top card from the pad, places it in the time clock, front side out, and stamps it. The employee then signs the card and takes it with him to his department.

During the day, as each new operation is started by an employee, he enters on the card the name and number of each operation. If an employee is changed from one operation to another during the day, he enters the time the first operation is completed, and the name and number of the new operation on the next line of the card. On piecework operations the employee also enters the number of pieces produced.

For "Extra" Cards

At the end of the day, time spent on the last operation is entered and the card is punched for time out on the clock. If an extra card is needed because there are not enough lines for labor distribution by account numbers, such extra cards are secured from the department foreman. These cards are the ones previously mentioned as extra cards.

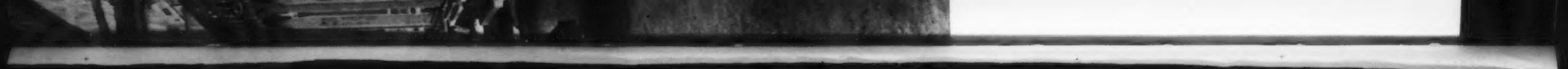
If an employee is transferred from his regular department to another, he secures an extra card from the department foreman, on which he enters his department number, his name and employee number, and the operation name and number.

In the payroll department the cards for the previous day are sorted first for extra cards. The extra cards that drop out are slotted for the department and employee number. All the cards are then sorted for refill. The refill cards that drop out are the cards for the employees who need a new pad of time cards. A new pad of cards is made up for each of these employees. They are made out in the same manner as the first pad, and placed in the time clock rack for that employee.

Cards are then sorted by departments, and slotted for each operation on the card. They are then sorted by employee numbers, and are figured for regular and piecework earnings for each operation on the card. The total daily hours and amounts are then entered on the "total" section of the employee's clock card. Total in the total section includes any earnings from extra cards.

Piecework earnings are first figured on piecework sheets, and the totals for each operation are transferred to the time card opposite the operation number. These entries are proved by checking the total of each employee's

(*Continued on page 208*)



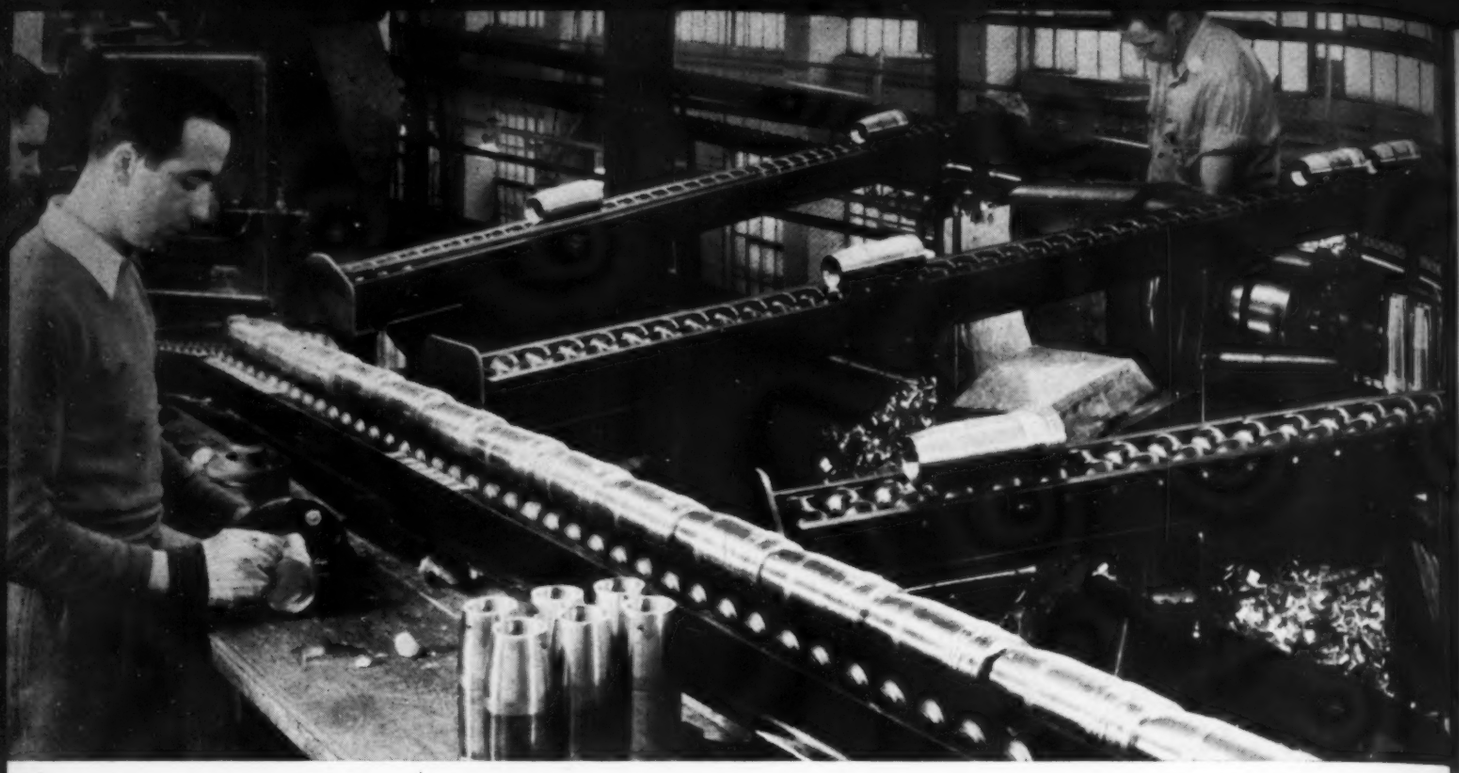
For description see page 33

MATERIALS HANDLING

Better Handling Boosts War Output ▸ ▸ Yard Jobs

▸ ▸ Production Moves ▸ ▸ Storage ▸ ▸ Out the Door

FACTORY MANAGEMENT AND MAINTENANCE — SEVENTEENTH ANNUAL SPECIAL SECTION — JULY, 1942



Driving bands have been finish turned. Shells are now on their way to final inspection, riding on concave roller conveyors (Standard). Contact at two points reduces possibility of damage to bands

We Say Again: Better Handling Will Boost War Output

IN PRACTICALLY EVERY INDUSTRIAL PLANT in America, the need for maximum output transcends all others. We say it again today, as we said it a year ago in the foreword to a special handling section like this one.

We said then that mechanical handling was one of the essential tools management could use to fill the biggest order of all time. A year has gone by. The exact status of that rush order must remain a military secret, but we know enough about it to be sure that industry has beaten its promises.

We know that our rate of war production has now passed Britain's—one race Britain is glad to lose.

And we know that management *has* used mechanical handling as one of its major tools to speed war output. We need no better testimony than our huge new plants and arsenals, those unparalleled results of the American genius for mass production.

Hundreds of other plants, however, have been converted, or are just now being converted, to war production. Speed, for the first time to them perhaps, has become the primary consideration. These are the plants, therefore, to which we now re-direct that message of a year ago. They must use every available tool, first to boost their output and then to lower their costs. Some will have to go to the swing shift. Others must shorten production travel. Still others have machine bottlenecks to break. All of them can use mechanical handling.

So to them we say today, as we said a year ago, that only full utilization of handling equipment will enable them to keep their promises, deliver the goods, and cut their manufacturing costs.

To these plants especially do we suggest examination of the examples of good handling usage shown in the pages that follow. In a long series of special handling sections we have found it possible to classify handling jobs in a number of ways. This year again we have chosen to break them down into *yard, production, storage,* and *shipping jobs*. Treatment in each example of handling is limited to a photograph and the briefest possible description consistent with the purpose of suggesting to plant operating men how they in their own plants "can do it, too."

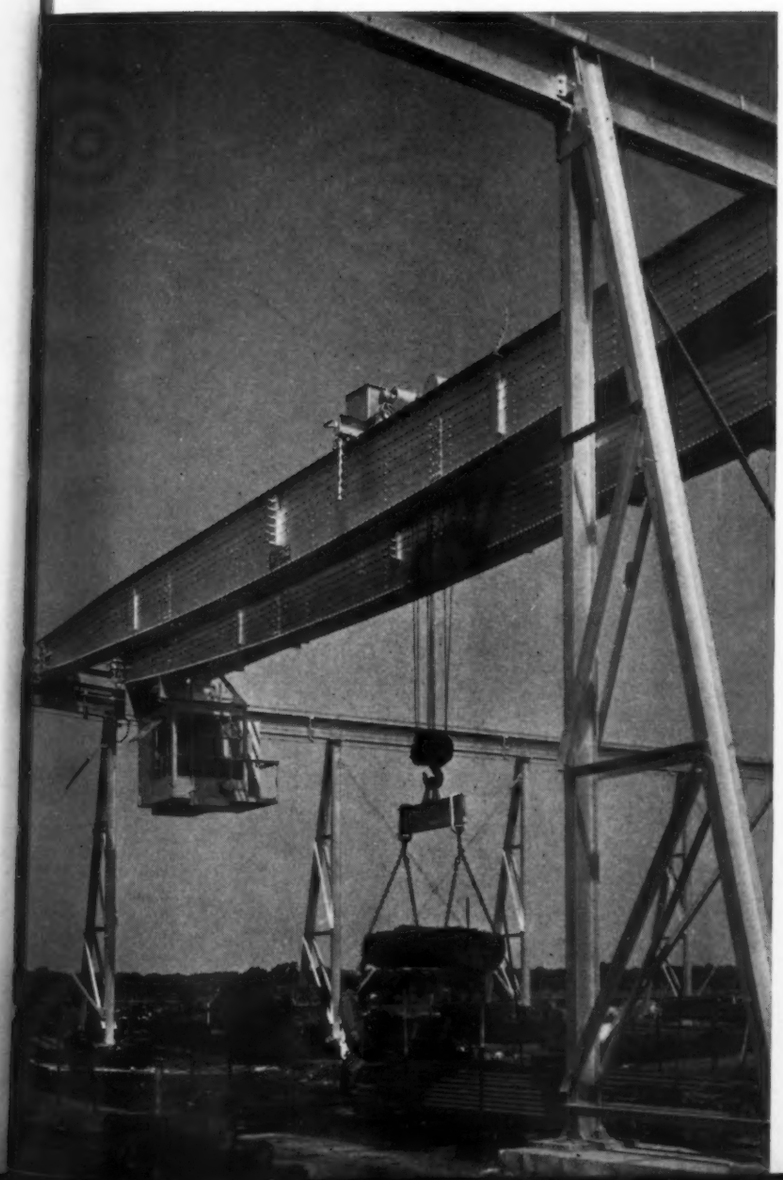
The goal ahead is still Donald Nelson's "too much too soon." Better handling can help every plant attain it.

Yard Jobs

It matters not how big the load, how long the haul. Yard handlers go anywhere, tackle any job

Crane With Magnet Gets in the Scrap

SCRAP! And still more scrap! Continuous operation of war industries depends on the size of the piles—and on the speed with which moves are made. An Eastern steel company bought a locomotive crane (Industrial Brownhoist) five years or more ago, uses it in heavy-duty magnet and bucket service 24 hours a day during a substantial part of each month. It is ready to go into action anywhere—at any time.



Call the big crane when more heavy material must be moved faster. Uninterrupted performance is what production men expect of the 10-ton (Whiting) crane, and uninterrupted performance is what they get. The crane must be able to "take it," for a breakdown frequently means shutdown of a plant

A veritable "Jack-of-all-hauls," this (Allis-Chalmers) tractor at the Beloit, Wis., plant of Fairbanks, Morse & Company. It stands ready to go places where more specialized equipment might be useless, and provides instant, economical transportation. Here a load of waste paper is headed for the baler

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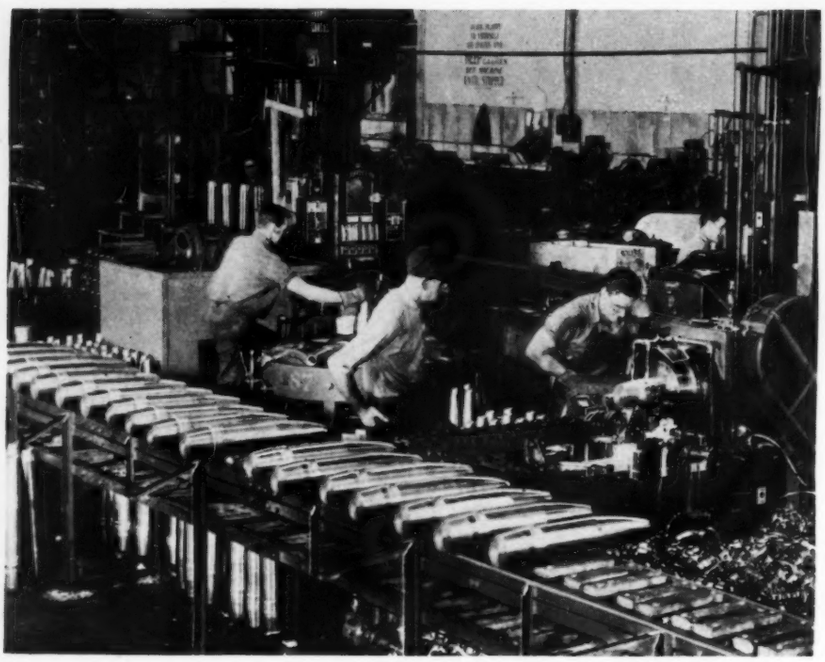
Production Moves

Schedules are made in the planning department. They are met on the production floor where machines are teamed with the right mechanical handling equipment



Pallet conveyor (Mathews) moves 155-mm. shells from band-turning operations to inspection. Pallets are wood—to protect shells from damage in transport. Short line of roller conveyor from lathe to pallet conveyor is made up of rubber-covered, concave rollers

Overhead Conveyor Dries, Stores, Moves

How to handle and store fabric-covered parts during drying periods constituted a poser at a West Coast aircraft plant. The problem was solved by installing an overhead trolley conveyor (Link-Belt).

The conveyor follows a winding path about the room, carrying the parts from one work station to the next, with work stations so spaced and conveyor speeds so adjusted that correct drying time is obtained between coats of paint. Special hangers were designed for each type of part. Final inspection is made while part is still on the conveyor.

Midwest manufacturer uses lift truck (Towmotor) to move skid boxes of forgings through inspection stations to freight cars. Loaded skid boxes weigh up to 3700 pounds. Used to take three men three days to load a car. Now one man and one lift truck load in three hours.

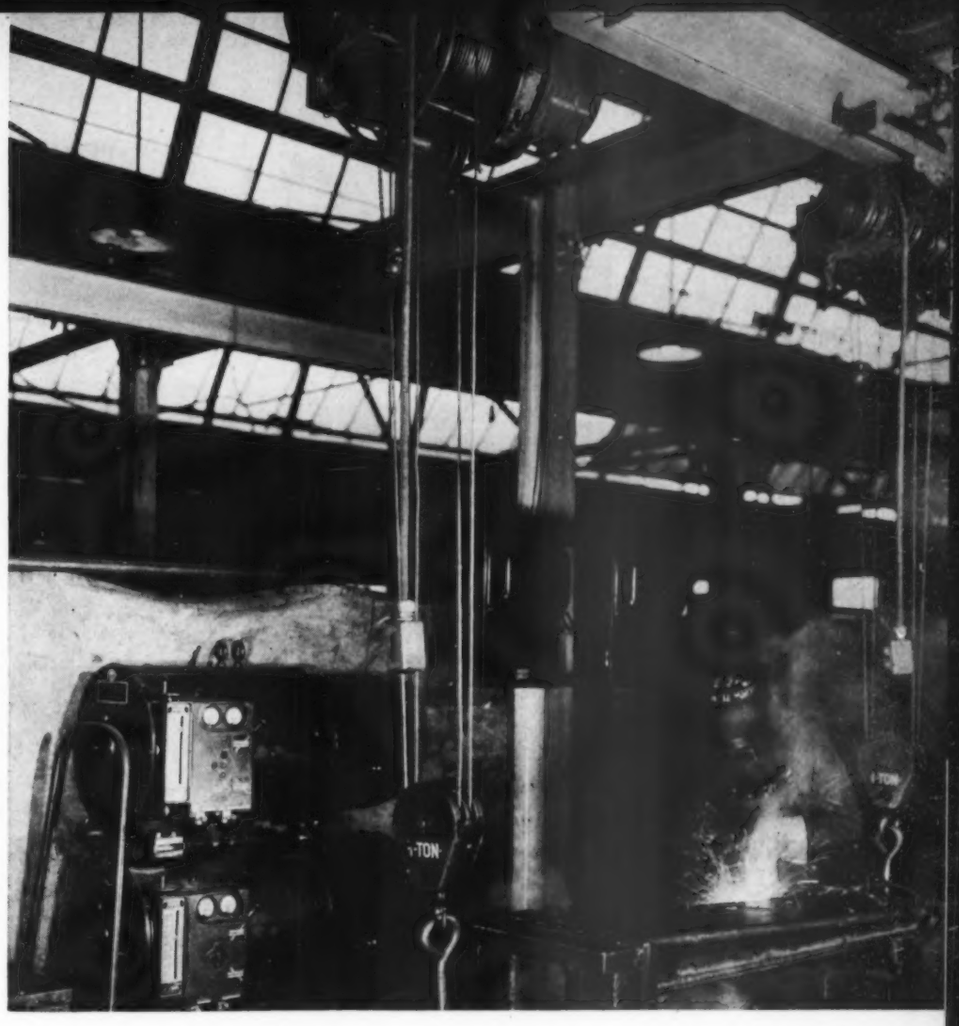
Does Heavy Lifting for Welders

WELDING poses two distinct handling problems. One is that jobs must be in convenient working position for the proper laying of weld metal. The second is that parts being welded are often heavy and of varying shapes. An electric hoist (Harnischfeger) provides answers to both problems. By simple pushbutton control, the operators can place heavy parts for tacking. And the hoist serves in positioning jobs from start to finish. It speeds welding production, and lessens danger of injury.

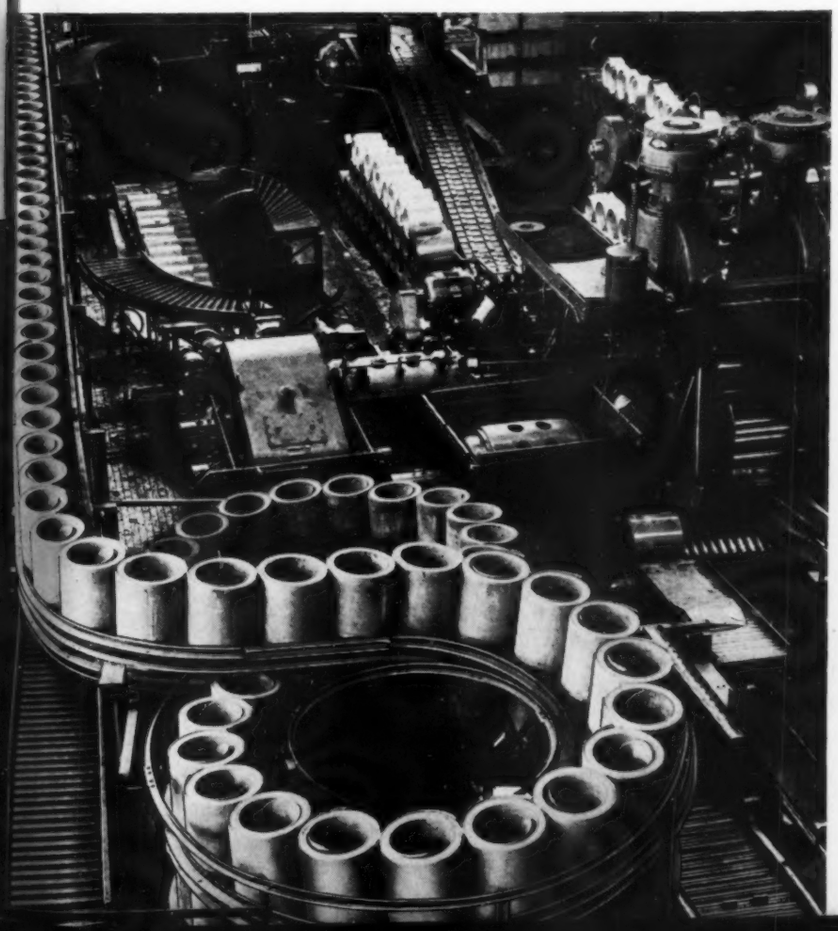
Moves Shells Safely

(See photograph on section cover)

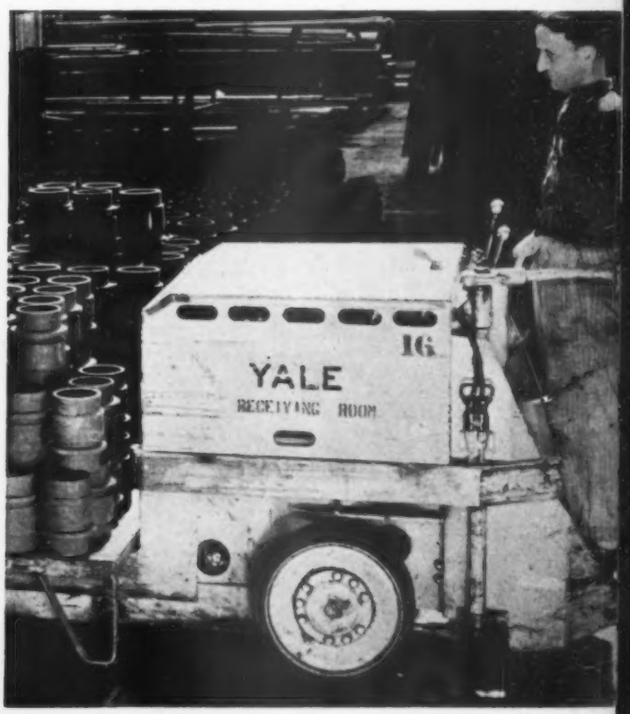
NON-SPARKING tramrail system (Cleveland) serves a great arsenal with 9½ miles of track, 652 track switches, 2872 carriers. Carriers and racks have heavy rubber bumpers. Switches are equipped with special alloy latch pins and fiber stop pads. Chilled iron wheels cannot cause sparks.



Coils of brass weighing from 300 to 600 pounds are handled with speed and ease on the gravity roller conveyors (Lamson) installed in a well-known mill. Operations have thus been condensed into limited floor space. "Live" storage has been provided



Low-lift platform truck (Yale) moves skidload of cylinder barrels from temporary storage to machining operations at Pratt & Whitney Aircraft Company. High-lift tilting fork truck is used in warehouse at same company to tier motors ready for shipment



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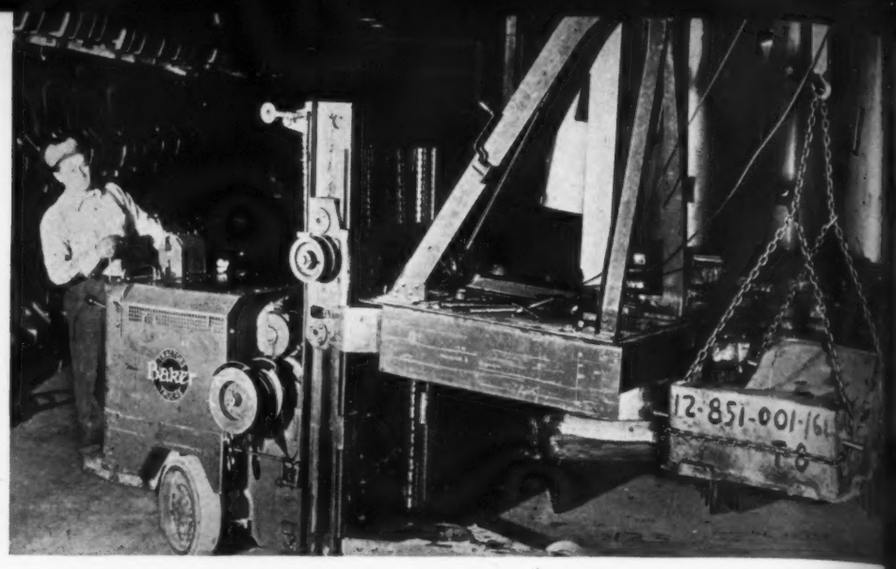
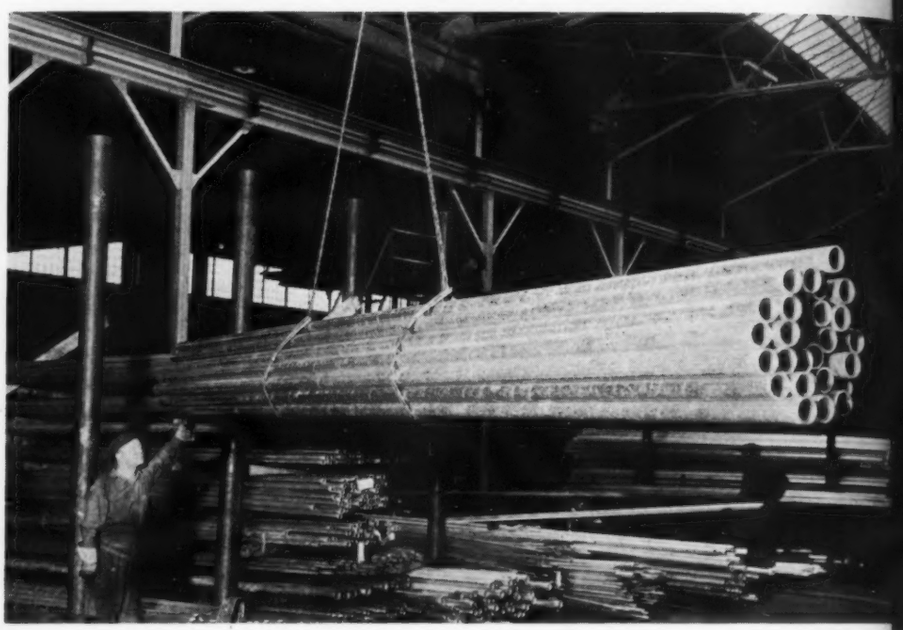
PRODUCTION MOVES

(Continued)

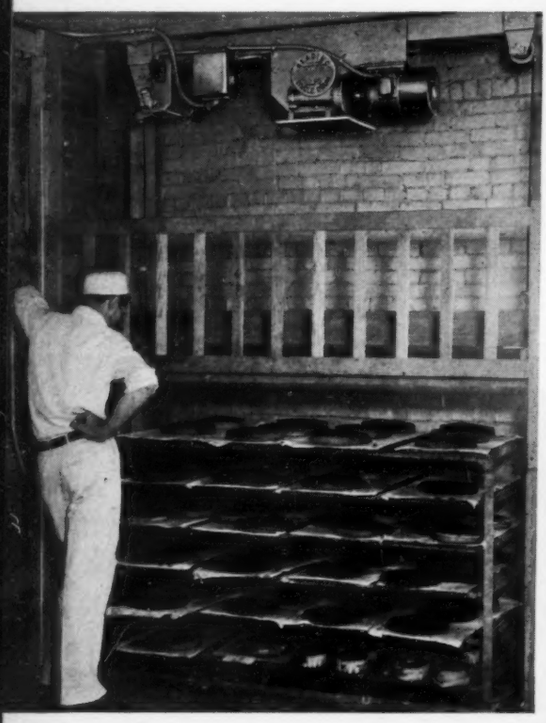


Fleet of trucks (Baker) plays an important role at Bell Aircraft Company, which brought its famous cannon-carrying Airacobra from the experimental stage to mass production in 300 days. Here a 3-ton high-lift truck with crane skid attachment provides fast, dependable transportation of dies from storage to drop hammer

To protect cakes in transit from baking ovens on first floor to icing and decorating rooms, a bakery uses special ½-ton hoist (Reading). Frame is extended to form pulley supports; two cables are wound on hoist drum—to provide safe trip upstairs. Pushbuttons at each landing insure positive control of load



Problem in handling big, unwieldy loads like the load of pipe shown directly above is to combine speed with safety. Both are insured when braided wire rope slings (Macwhyte) are properly rigged



For quick, safe handling of Navy plates through galvanizing operation, the Philadelphia plant of Joseph P. Cattle & Brothers relies on 4- and 5-ton motor trolley hoists (American Engineering)

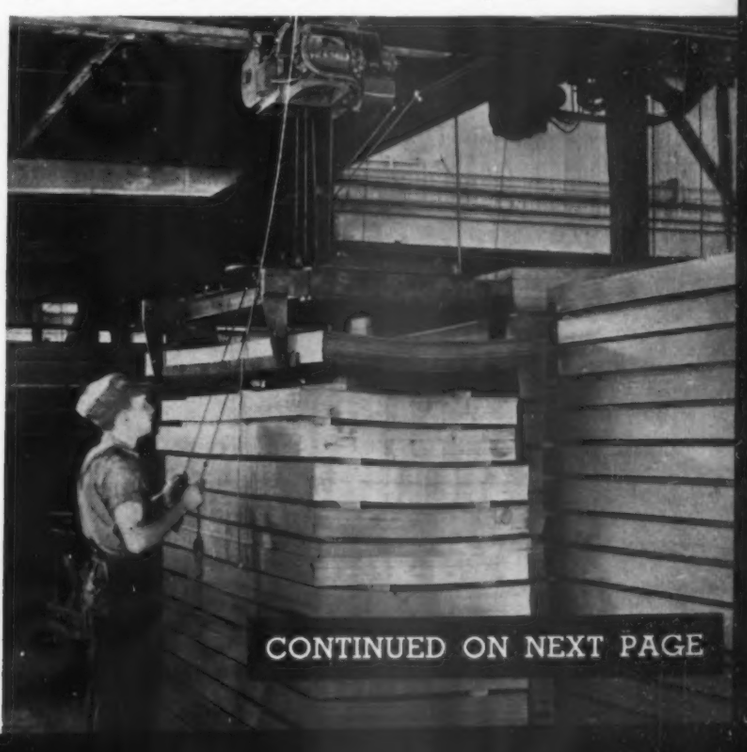
Into Storage and Out

Mechanical handling equipment makes quick trips to and from storage areas possible, permits full use of "air rights," conserves valuable space for production uses

Pallet and fork truck (Mercury) combination makes effective use of storage space at Borden Company. Sit-down center control makes for quicker, easier moves

Oil burner plant now converted to war work piled crated units five-high. As units entered warehouse via conveyor, man with hand truck yanked one off, rolled it to his partner aboard the big telescopic lifter (Service Caster)

Stackable steel racks and a gas-powered fork truck (Clark) have replaced wooden trays and manual handling at Pittsburgh Tube Company. Storage capacity has been doubled, carloading capacity tripled, carloading cost cut 25 percent. Below, right, a 2-ton hoist (Robbins & Myers) with special sheet steel grab designed to take little headroom saves space at Vitreous Enamel Products Company



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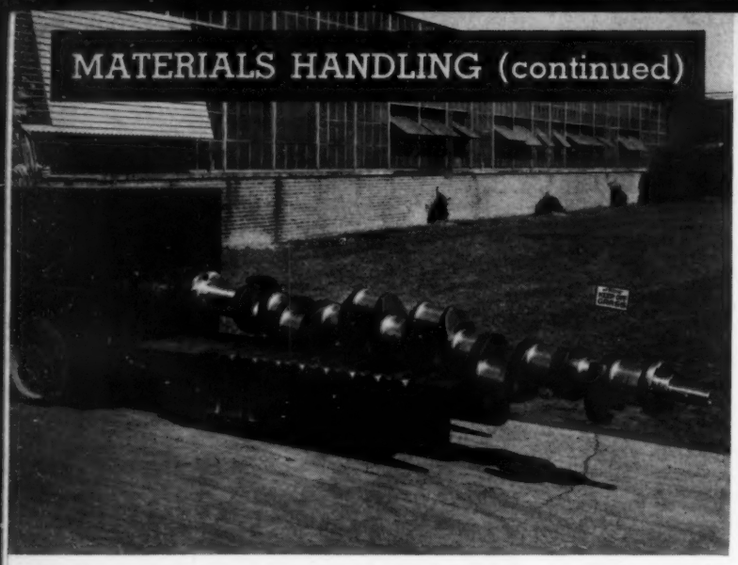
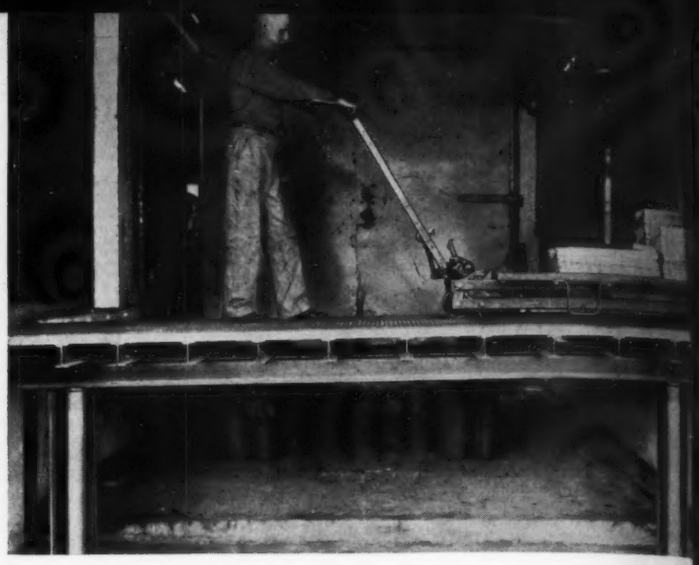


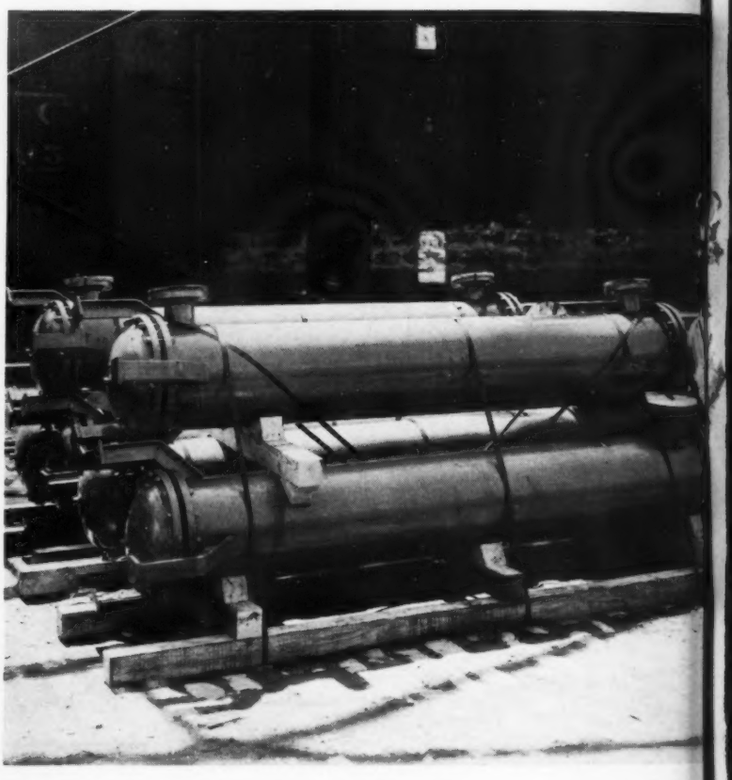
Electric truck (Elwell-Parker) makes easy work of transporting a 2-ton diesel crankshaft from final machining department to shipping room floor



Material lift (Joyce) doubles as loading platform and bridge between two buildings at McCormick Brothers Company. It is electrically controlled

Out the Door

And so to the customer—very likely the Army or the Navy. In the shipping room, as in every other part of the plant, full use of handling equipment means maximum output in the shortest possible time



Four-wheel hand lift truck (Lift Trucks, Inc.) has rear drive, with a heavy-duty controller unit that permits quick maneuvers in tight situations

Steel Straps Cut Shipping Costs

A LARGE MANUFACTURER of oil and water coolers is a willing convert to the practice of shipping his product on skids. The coolers owe their safety in transit to the steel strapping (Acme) that is employed to hold the units on the skids. Considerable bracing and crating material is eliminated by this economical shipping method. Also, there is a tremendous saving being further increased by a saving at the receiving end where it is necessary only to snip a few straps in order to prepare the units for installation.

A further advantage to the manufacturer is derived from the fact that the cooler units may be shipped one, two, or (as illustrated here) three to the skid.

Records by Camera

Traffic, merchandising, shipping, factory service, inspection, testing, research departments—all can use a camera to good advantage in making authentic records that leave no room for argument. A method that's quick and inexpensive, too

WALTER J. BROOKING, Testing and Research Department, R. G. LeTourneau, Inc., Peoria

TAKING A PICTURE is one of the most universally applicable methods of making graphic, authentic, and complete records in a manufacturing organization. Of course, the most economical use of photography as a means of record-making depends upon the knowledge on the part of certain key men of the effectiveness of taking a picture at the right time and in the right way to tell the story.

This does not mean that key men have to be photographers. It does, however, mean that they should know something of the mechanics of photography, of the general objective visualizing required to plan or to see a good record-making picture.

One photographer who knows industrial photography and who is equipped with even a relatively inexpensive camera and a flashlight can serve the needs of the organization. An extension cord, floodlights, and reflectors increase his usefulness. A darkroom in which to develop his pictures may or may not be economical, depending upon the size of the organization and the amount of photographic work done.

The photographer should be always on call. One of the most important steps in the economy of such record-making is to have the foreman or supervisor who calls for the photographer's service know just what he wants, have the proposed picture visualized, the subject of the picture in position and ready when the photographer arrives. The photographer should then be told exactly what the picture is supposed to show. It is often possible, with the proper preparation, for the photographer to come to the scene, set up his apparatus, take the picture, and be gone within five minutes.

Last year the printing department in the LeTourneau plant at Peoria printed 46,000,000 completed units. This included 180,000 copies a week of the company's plant publication Now, advertising matter, specification sheets, parts catalogs, operator instruction handbooks, stationery, office and factory forms, and many other pieces. The department is entirely dependent upon photography for its processing, because it uses the offset, or lithographic, process.

Here the photography is somewhat specialized. It is, essentially, a process where the type is photographed as one negative, and pictures used to illustrate the text are photographed through a screen, forming a second negative. The picture-impressions from the second negative are fastened in their proper place on the first negative and the resulting negative is burned into a thin zinc plate that is put in the printing press and serves the same purpose as type and engravings in the letterpress printing process. Figure 1 shows the camera used for photographing type or pictures in the printing department.

The traffic, merchandising, and ship-

Figure 1. The offset, or lithographic, printing process depends on a camera. In 1941, about 46,000,000 pieces of printed matter were turned out—with a minimum of time and effort

Figure 2. Was a carload of steel in good condition when it was received? A photograph is proof positive of good or bad packing

ping departments use pictures extensively in their records in three different ways:

1. Pictures are taken of carload or truckload lots of merchandise received at the plant, to prove the condition in which the material was received. Figure 2 shows a carload of steel that arrived at the plant in good condition. Blocking and packaging of the steel are evidently satisfactory. If this carload had arrived in bad condition, bundles broken and lying close upon each other so that it could not be unloaded conveniently, the picture would have shown that condition.

2. The shipping department uses photographs to show methods of packaging and crating merchandise (Figure 3). Two or three pictures after the unit is packed—which require five or ten minutes to take—may save costly mistakes and many hours of reading and writing instructions to describe a package or to duplicate a certain method of packing.

3. Photographs form an authentic and relatively complete record of a carload of merchandise boxed, blocked, and tied on a car for shipment (Figure 4). In this case enough of the car is included to show the packages, blocking, tying, and, especially important, car number and insignia. Photographs of such a carload give a complete practical record of a shipment of merchandise which can be used not only to demonstrate the method of packing if accidents in transit occur, but also to describe the size of packages and method of shipping of certain units to purchasers, trans-shipping agencies, and insurance companies.

Simple pictures showing the apparatus used for certain processes, such as checking machine parts (Figure 5) by the inspection department, are effective in recording methods of accomplishing certain processes. Almost any mechanical set-up in an ordinary shop can be shown. Usually one or two pictures will give enough of the detail of a mechanical set-up or a tooling arrangement on a lathe or other machine tool, or will show the fixtures used for templets for certain cutting or shaping operations, or dies used in pressing or forging shops.

Here again, pictures are great time-savers because they enable a shop man to visualize and duplicate a set-up in a few minutes, whereas he might spend much more time trying to get the same information from a page or two of written instructions and description.

Pictures can be correlated with the tool and die departments by inking in the part number or structure number

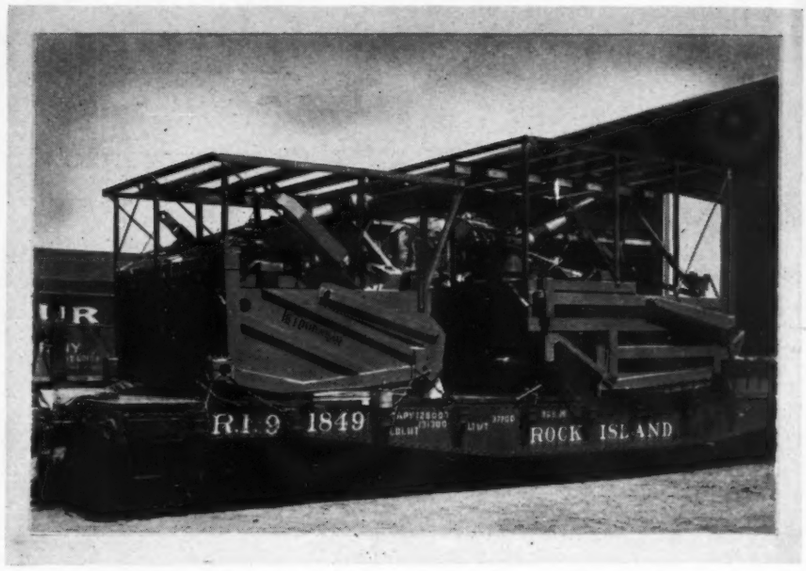


Figure 3. How should units be crated for export? A glance at the photographic files, and the exact method is immediately apparent

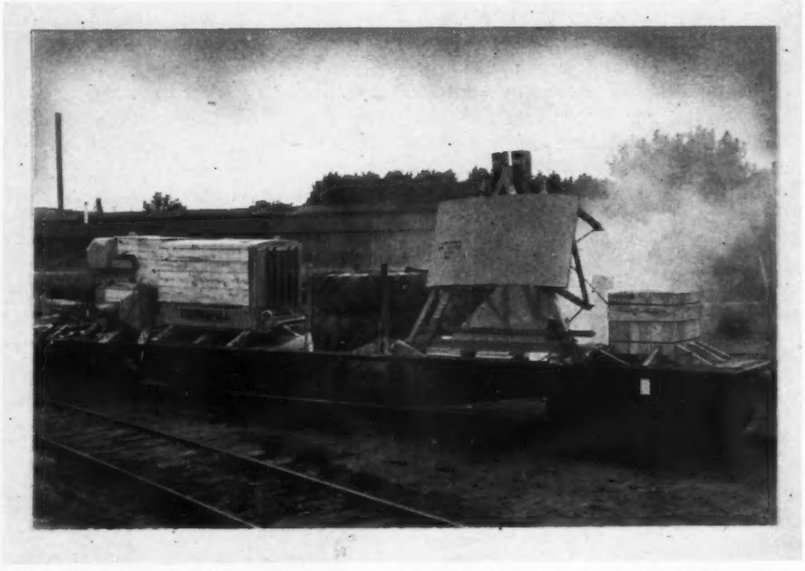


Figure 4. No chance of anyone saying that some part of the shipment was omitted, when a photograph accompanies the invoice

of a jig and die set-up after the picture is taken. The photograph is then presented to the tool and die room, and the part listed can be delivered to the set-up man at a considerable saving of time.

Another department in which the use of photography is important and often a significant factor in economy, is the field and factory service department. Pictures of parts that have failed are as effective a description of the failure as a view of the piece itself, and it is much less expensive to take a picture than to return the original part to the factory. The economy of having field servicemen trained in the use of a camera may therefore prove of great importance in describing failures of equipment, making settlements, and correcting design to prevent future failure. Placing an identification number or note in the picture when it is taken serves to establish an authentic mark of identification which may be used in referring to a case history.

Accurate and complete records are essential in the testing and research department. The resourceful use of photography in making routine and

(*Continued on page 212*)

Using Foremen Conferences to Build Morale

DALE PURVES, Treasurer and Production Manager, John B. Stetson Company, Philadelphia

Our company, founded in 1865, had always had an open shop. During the NRA, the employees formed an independent union, with a primary objective of bargaining collectively for wages. In three following years the collective bargaining relationship made little progress, and the independent union joined a national union affiliated with AFL. A formal labor contract between the company and the union was signed in December, 1936. It was the collective bargaining situation resulting from this recognition that brought about our foremen's conference plan.

As a result of the contract our foremen were in a most difficult situation throughout the first half of 1937. They were expected to maintain production, but their prestige had been weakened. Employees were going over their heads in matters of grievances, discipline, and even firing. The foremen needed to know the policy of the management and we, top management, needed to know the problems of the foremen in order to formulate wise policies. To strengthen the position of the foremen, in 1937 we began what we called the foremen's conferences, which are really part of the foremen's training program.

Before starting these conferences we decided that men of the same capacity for responsibility and of the same rank should be grouped, rather than men from the same department. We believe, and experience later proved us right, that men are more at ease together, and at the same time can best be addressed, when they are in a group made up of those doing work requiring the same ability. We now have eight groups of approximately 20 men. When more than 20 are present, the men are reluctant to speak freely. Top management uses these meetings to convey previously established policies to the foremen, whose reactions are eagerly sought. The subject matter taken up in each group is identical, but the presentation varies.

In making a success of any such conference plan I cannot emphasize too strongly the importance of putting careful thought and effort in preparing the subject matter to be discussed in the conference. Anyone who tries the conference plan must be prepared to say to himself "I am going to get their frank response." And he must not be discouraged, if he does not get it at once. For the first few meetings the men are skeptical. They do not know what it is all about.

Encourage the Speaker

To break down the silence and establish confidence, the leader must display the utmost candor. He must also bear in mind that many of the men do not have the education or the experience to get up and talk. When a man does get up, the leader must do everything possible to encourage him. When the others see that he is encouraged and protected they are bound to follow.

Posters, notices in pay envelopes, and literature mailed to the homes of the men have some value, but we believe there is no substitute for our conferences in explaining to the foremen the policies of the management, or for building up morale of foremen, who are the men on the firing line in employee relations. The conferences are considered as company business and held on company time about once a month. We find that a good conference runs an hour at least, but it should not exceed an hour and a half.

Our foremen's conferences were so helpful in improving our relations with our employees, and in helping to overcome some of our management problems, that we decided to extend the conference plan to a group of junior executives who wanted to talk things over with top management and get advice on their daily problems. Therefore, we inaugurated what we called the advisory council. It is limited to fifteen junior executives. A certain number of them rotate in and out of office, so that the council may have as wide a membership as possible and still not be too large a body to discourage free discussion.

This group has been chiefly concerned in improving administration and control of materials and processes, as well as problems arising between various departments. Simply stated, the philosophy behind the conference and the advisory council plans is to give foremen and junior executives the same opportunity of conferring with one another, and with representatives of top management, that top management itself enjoys.

Subjects That Are Discussed at Least Once a Year with Every Group

Financial aspects of the business

Here we have developed a presentation similar to that used in many of the modern versions of annual reports

Review of the labor situation

We study the general labor situation as well as the labor picture at Stetson. We attempt to keep our supervisors informed about future labor needs rather than let them learn from indirect sources

Costs and budgeting

The foremen are made to see that the successful operation of a budget depends upon their cooperation, first, in setting up the budget and, second, in meeting it

Personnel policies

We make a point of having personnel policies originate in the conference, where everyone is given a chance to say what he thinks of them

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Movable belt conveyor extends out of building to load trucks waiting beneath

Movable Conveyor Simplifies Loading

GILBERT LINDGREN, Electrical Foreman, Hudson Valley Fuel Corporation, Troy, N. Y.

Shown in the illustration is a short length of belt conveyor mounted on trucks, which has greatly simplified one of our loading problems. The material handled is dropped into a hopper by a crane equipped with a bucket, and then flows onto the conveyor. The trucks permit the conveyor to be extended out of the building approximately 10 feet.

Box cars are loaded by extending the conveyor out only part way and using a chute.

The driving motor is mounted on the conveyor frame and is connected to the starter by a flexible lead.

•

Coupons for Cost and Production Control

E. P. DOLLIVER, Production Manager, R. Wallace & Sons Manufacturing Company, Wallingford, Conn.

Use of this coupon strip ticket affords simple and economical production and cost control. It can be adapted to many types of products, particularly those where production is divided into standard batches, and where the quantity started carries through to an inspection point where the work can be rebatched for subsequent operations.

Some type of duplicating equipment is necessary. In those industries where a number of products are made, yet the total yearly quantity production on any one product or style is not large, a liquid hectograph type of duplicator is desirable. For large runs, ticketograph, addressograph, or multigraph may be the answer.

A master copy for each product or style is prepared. As production is required on an item, its master is pulled from the file in the production department, and the required number of coupon strips are run off. Each coupon strip is numbered and an office record is kept of the numbers issued. The coupon strips are sent to the manufacturing department as authorization to manufacture a definite number of batches of the particular item designated on the strip.

The stock clerk places the strip in the box containing the material, and the work proceeds to the first operation. Upon completion, the worker tears off the bottom coupon and indicates his clock number and date, at the same time indicating his clock number on the top coupon against the number of the operation that he has performed. At the end of the day, these tickets are handed into payroll and totaled for the worker's earnings. When the work

(*Continued on page 220*)

[redacted] Standard Allowance

1234 Cost Ticket D.L. 25 - .135 - 3.375
O.H. 25 - .270 - 6.750
Mat. 25 - .40 - 10.000
This Ticket to Cost Dept.

[redacted]

1234 Making Dept. to Polishing Dept. Move Ticket
This Ticket to Prod. Control Dept.

1234 Oper. 2 Anneal Employee_____
[redacted] Date_____
Making Dept. 25 gro - .04 - $1.00

1234 Oper. 1 Blank Employee_____
[redacted] Date_____
Making Dept. 25 gro - .02 - $ .50

Strip ticket covers seven operations on this job; first two are shown here plus cost ticket and move ticket. (Name of product is deleted)

MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

Today's Maintenance— and Post-War Production

How WELL should buildings and equipment be maintained during this production-for-war period? The answer is not necessarily, "In perfect condition." Nor is the answer the same for every plant.

There are several answers from which, possibly, each plant can pick one for its own peculiar conditions:

In first-class working condition.
Just enough to keep things running.
So there will be no serious breakdowns.
So maintenance costs will be very low.
So the machinery will last a long time.
So the machinery will last just as long as the war.

Any one of these answers can be right for *some* plant. So can combinations of two or more. Some buildings are going to be abandoned just as soon as emergency orders stop, while others will be just starting on a long period of peacetime production. Some machines are going to be obsolete, while others will be just the thing for economical production.

Which answer, or what combination, fits a given plant will depend upon what is in store for that plant in the way of post-war production. Obviously, it will be a rare maintenance engineer who can see that far into the future. He can, though, try to find out from his plant's policy-forming executives.

If he succeeds, he can allocate maintenance materials and the services of maintenance personnel and machines in accord with a definite policy. On the one hand, he can save much time and money; or, on the other, have the plant ready to jump out ahead when the signal for post-war production is given.

Using Much Wood Instead of Steel?

SOME DRASTIC STEPS are being taken to bring about the conservation of materials. Included under the classification "scarce" is steel, which may no longer be used in the manufacture of many products for civilian use.

Attention has been centered upon the use of steel for production purposes, because that is where the big savings can be made. But here and there we find examples of the substitution for a steel item of an item made from some other material.

We have heard about wooden ducts, wooden fire doors, and wooden pipes. Such products, which we are assured can be used with perfect safety, appeal to the imagination. They cause us to wonder if many plants in their maintenance work aren't substituting wood for metal in ways that other plants would like to learn about. FACTORY will be glad to pass along the information if its readers will just send it in.

We Suggest: Maintenance Work Induces High Morale

THERE IS A GREAT DEAL of shouting, we are reminded, about doing things to the morale of production workers. Then we are told that there's never a word about the morale of the maintenance employee.

We confess to the shouting about morale; in fact, we pretty nearly claim the field. But we deny that there was any intention of limiting morale building to production forces. The objective was to build morale—or, as FACTORY frequently calls it, the *will to win*—in the minds of the people of industrial plants, so these people would turn out more production.

And, we submit, the maintenance employees are part of the people of the plant and just as essential to output as are production workers.

We'll go further and say that there always has been something about the job of keeping the plant on the ready that has automatically built a superior kind of *esprit de corps*.

Users Should Report Equipment Performance to Makers

IT IS THE MAN concerned with maintenance who is in the best position to find out whether or not a piece of service equipment has been engineered to the job it is sold to do. If the equipment does not do the job he bought it for, he gets rid of it.

But he does not stop there if he does his full duty by himself, his plant, and the manufacturer of the equipment. He owes the manufacturer something—a bawling out for selling what he should not have sold; or an apology because he, the maintenance engineer, bought what he should not have bought for the job; or just plain helpful, constructive information.

It is particularly difficult in these days, when every transaction is carried out on a special-rush basis, for buyer and seller to get together on specifications. Many a misapplication is made. And many of these misapplications could form the basis for improvements in design and construction if maker and user got together to exchange information.

How We Train Plant Police and Firemen

A well-trained police force and an efficient fire brigade help to keep production flowing smoothly by checking potential danger points and preventing trouble

R. F. PETRASEK, Plant Engineer, Carrier Corporation, Syracuse, N. Y.

WE HAVE BEEN GUIDED in organizing our plant police force and fire department by a principle which we believe to be thoroughly sound—that any expense or effort required to do the job right is a fine investment and should pay dividends. When the safety or perhaps the lives of employees, and the safeguarding of plant buildings, vital equipment, and material are at stake, halfway measures are largely a waste of time, of energy, and of money.

We have approximately 600 employees scattered through a plant that comprises three main buildings, with a number of smaller structures. The building contains more than 1,300,000 square feet of floor space. Our departments present hazards that are commonly found in most metal-working plants. A good deal of our equipment, however, is of special design, and could not be readily replaced, particularly during these times. Aside from the fact that much money has been invested in it, our plant means jobs and a livelihood for a great number of people. Therefore, if for this and no other reason, it is worth protecting in every possible way.

Practically, there are three major hazards from which every plant must be safeguarded—sabotage, theft, fire. For protection against human enemies, we consider that a well-organized and trained force is indispensable.

Our police force consists of a chief, three captains, and fifteen patrolmen. A great deal of care is taken in selecting these men, many of whom are former policemen, or have had military experience. For example, they must be between the ages of 25 and 45, and are required to pass physical and other examinations that are somewhat more rigid than those employed at present by the Army.

We have graduated our police force from that category known as "watchmen." You will recall that old, faithful, slightly rheumatic gentleman, who found it rather difficult to get around on rainy days, and who was slightly deaf. The old pensioner, as it were, whose honesty was never questioned, and whose courage has been evidenced more than once by the supreme sacrifice on the altar of duty. It is, of course, possible that this type of employee may fit into the new scheme of plant protection, but for some old-timers it may be difficult to throw overboard old conceptions, ideas, and customs of the past. For not only must industry cope with what were con-

Men on the police force are taught various holds of a modified form of jujutsu. At the extreme left the "intruder" has been overcome and handcuffed. The man with the gun (right center) is using FBI's method of searching a prisoner for concealed weapons. Note the footwork

HOW WE TRAIN PLANT POLICE AND FIREMEN (continued)

sidered accidental and incidental hazards in the past, but we have, in addition, the unscrupulous cold cunning of the saboteur, whose one aim is the destruction of life, limb, and property, even at the sacrifice of himself.

We use the term "patrolman" rather than "guard" because we feel that this title really describes the duties of the police force much better. Patrol work is, in reality, an important function, which entails other considerations besides guarding property.

After they have been accepted, patrolmen are given a thorough instruction in their duties and responsibilities. Topics covered in the training course include police procedure, limits of authority on and off property, false arrest, collection of evidence, how to handle intoxicated or other rambunctious persons, and how to recognize and report any infraction of company rules and regulations. Training is also given in self-defense, first aid, and general deportment.

We consider the general deportment and the attitude of patrolmen are of more importance than is sometimes realized. At best, patrolmen have a difficult job. They are constantly in intimate contact with all

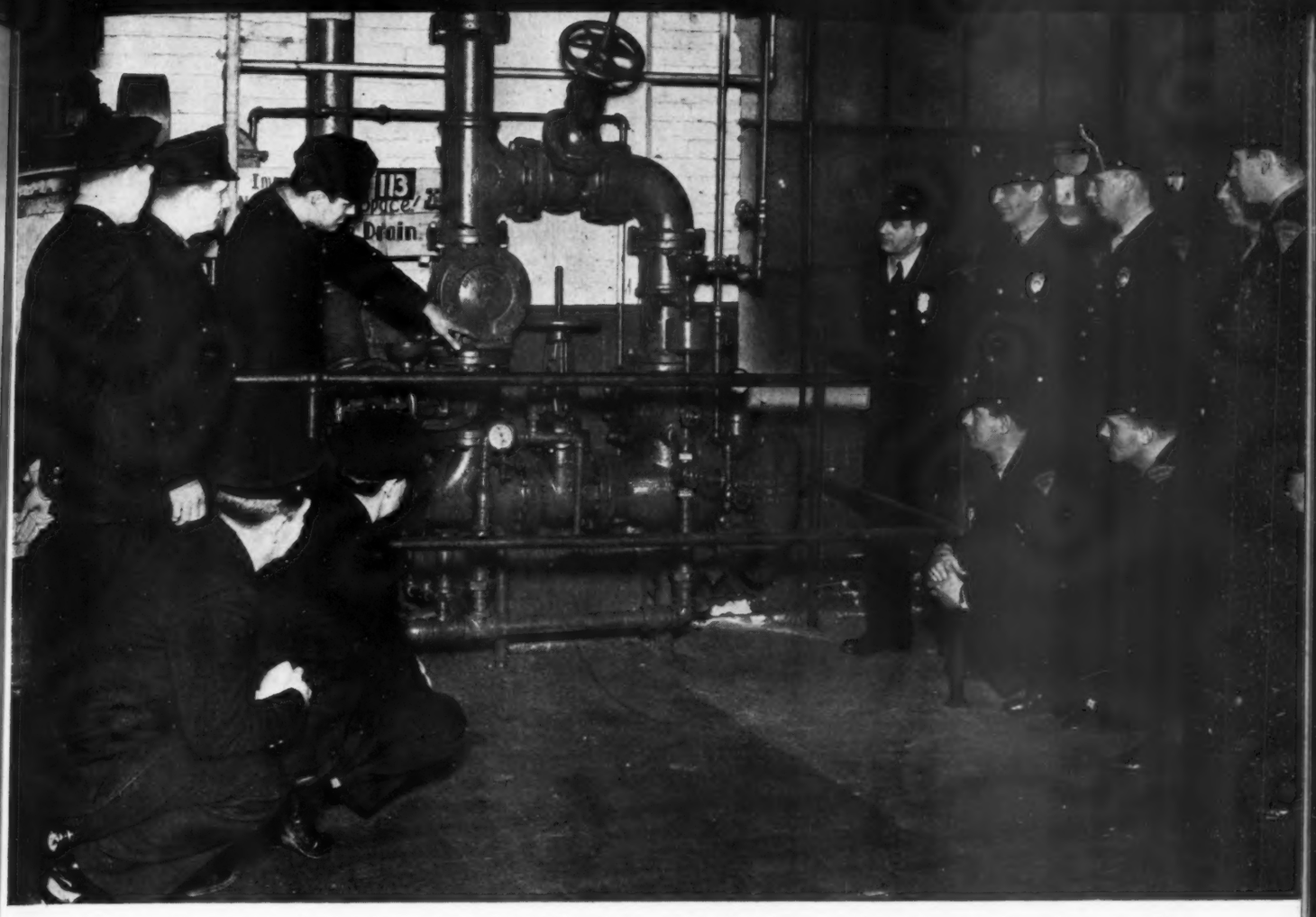
PATROLMAN'S RATING SHEET

Date _____ Patrolman _____

1. Loyalty
2. Integrity
3. Honesty
4. Intelligence
5. Knowledge of duties
6. Physical fitness
7. Alertness
8. Ability to handle and control people
9. Ability to obtain the assistance of employees
10. Tact and diplomacy
11. Ability to maintain secrecy in connection with confidential reports and official duties
12. Personal appearance
13. Personal attitude
14. Patrol duties and observation
15. Ability to obtain information vital to plant protection.

Captain _____

In addition to regular fire drills, firemen are given classroom instruction in all phases of fire prevention and fire fighting. Emergencies are discussed from all angles, answers worked out



Plant policemen and members of the fire brigade learn all about the various types of sprinkler systems in the buildings. Their uses and abuses are emphasized, as well as the correct way to operate and maintain them. Every man has to learn the location of each shut-off, drain, and hose connection

Patrolmen take a first aid course. They are called on for this service when the dispensary is closed. Artificial respiration is an important part of the training. Each man must go through this drill

employees, and must see that regulations are enforced. Too much familiarity, leniency, or tendency to "look the other way" is certainly bad. On the other hand, a bullying, sourpuss attitude is distinctly bad for employee morale, because it creates dislike and contempt. Patrolmen must be taught to be firm but courteous, cool-headed, and entirely unbiased in their dealings with employees, in order to obtain their respect and confidence.

We have also taken a great deal of pains to have employees realize that the patrolmen are not spies or snoopers, but a group of trained men whose sole function is to protect personnel and property.

In addition to their instruction in the subjects previously named, all patrolmen are given a thorough training in fire fighting; and are also trained to observe safety hazards, such as operation of punch presses without adequate or proper guards, or unsafe work conditions; to report inadequate lighting, tripping, and the hundred-and-one practices that do much to add up the toll of accidents in plants. Patrolmen are given an intensive course of instruction relating to subversive acts and espionage. This training today is vital and includes such outlines as methods of sabotage, methods of espionage, and vulnerable points.

Patrolmen must know the location and operation of all fire-fighting equipment, sprinkler valves and shut-offs, main water and gas valves, power and light switches, and other important service equipment. Except during the first shift, three patrolmen and a captain are on duty during all working hours. A tour of duty has been plotted to take care of the entire plant. A supervisory clock system makes it impossible or impractical to "short-circuit" this patrol. Patrolmen are trained to take appropriate action on infraction of regulations, and to report all fires or accidental hazards, or anything else that may endanger the personnel or plant.

To make sure that the patrolmen consistently meet the high standards we have set for them, each captain is required once a week to rate every man under him, and to conduct a written examination relating to his duties, location of emergency devices, the uses and abuses of fire equipment.

The Fire Fighters

In the fire-fighting brigade, we have 30 officers and men, who are regular employees of the various plant departments. Their activities are directed by three assistant fire chiefs, and the plant engineer himself serves as a chief. In addition, members of the maintenance force are ex *officio* members of the fire brigade. These men include porters, carpenters, electricians, pipefitters, and firemen, and from the nature of their work they are thoroughly familiar with every detail of the plant, such as location of valves, switches, and unusual hazards. Hence their primary duties in times of emergency are to see that the power is shut off, and that other necessary activities and precautions are taken, rather than the actual handling of fire-extinguishing equipment. Porters receive special training in salvaging, mopping up, and cleaning up, which are such vital factors after a fire.

Members of the fire brigade have been selected just as carefully as the patrolmen. Prime requirements are that they be strong physically, active, and alert, but more important, they must be generally interested enthusiasts, so to speak. With a few exceptions, members of the group belong to the volunteer brigade in their communities, and every member is enrolled in the Syracuse Fire Department Auxiliary, and is receiving additional training in fire fighting and fire prevention.

Membership in our fire brigade means training, and a lot of hard work. Through lectures and demonstrations the men are given an intensive course in fire fighting and fire protection. In this course we have 49 different phases of work, including common fire hazards; inflammable liquids; gases; electrical hazards; methods of extinguishing fires in all types of material; characteristics, uses, and abuses of all types of fire extinguishers; inspection and maintenance of extinguishing equipment. Demonstrations are full-scale affairs rather than the type of exhibition that may be staged in a classroom. For example, we will start a good fire, fed by gasoline, lacquer, and other flammable material, in a safe place on the plant grounds, and show not only the proper way of extinguishing a fire, but also the improper way that might prove disastrous to the firemen and to the property.

Fire drills and lectures are held

Patrolmen are taught to recognize subversive acts and are shown how to prevent them. All incoming shipments of materials are rigidly inspected to guard against sabotage

Members of the fire brigade are trained much as are the rookies in municipal fire departments. They are instructed also in the practical application of all types of equipment in the plant. No fancy drills

twice a month on company time. Once a year the fire brigade stages a real demonstration. This demonstration, which is open to the employees of the company, is of value from several standpoints, as shown by the fact that it is attended by practically every plant executive, as well as by officers of the local, municipal, and volunteer fire departments, and by fire prevention engineers. That our management is interested, is convincingly shown by their invariable attendance at these fire demonstrations. On the other hand, if these executives had not been vitally interested in plant protection, it would not have been possible to set up such a high standard for our present police and fire brigade.

Any fire-fighting force must have an adequate amount and the right kind of equipment to work with. Therefore, in addition to complete special protection in our buildings, we have installed hose lines, foam machines, hose reels, various types of hand-operated extinguishers, fog nozzles, floodlights, gas masks, and fire blankets at strategic places throughout the plant. In addition to this general equipment, specific types of extinguishing equipment are provided for each location where the hazards are in any way special or unusual.

Alarms are turned in and sounded over a coded fire alarm system. For minor emergencies, such as a sprinkler break, an emergency call is sounded over the paging system. In this way we can assemble the emergency crew without the excitement and disruption of production that generally occur when an alarm of fire is sounded.

However, with all our equipment and trained men, the idea that we can or should be self-sufficient and need not call for outside help in an emergency, finds no place in our thinking. When a fire breaks out, nothing is left to chance. The call is immediately sent in to the city fire department. It is better for everyone that the city fire department spend a few moments on a needless run than to risk the perils of fighting a bad fire that may get out of control, with resultant losses of property and perhaps lives.

It would not be entirely accurate to say that we are looking for trouble. But it can be said with truthfulness that we have prepared ourselves as thoroughly as we can, just in case!

THE FIRE BRIGADE STUDIES THESE SUBJECTS

1. Fire losses and fire protection
2. Loss of life by fire
3. Fire protection organizations
4. Laws and regulations
5. Common hazards
6. Heating appliances
7. Extinguishing flammable liquid fires
8. Gases and internal combustion engines
9. Finishing processes
10. Electricity
11. Protection against lightning
12. Dust explosions
13. Hazardous chemicals and explosives
14. Nitrocellulose and pyroxlin plastics
15. Spontaneous heating and ignition
16. Fire causes by occupancies
17. Retarding the spread of fire
18. Fire resistive construction
19. Heavy timber construction
20. Roofs and coverings
21. Protection of openings in walls
22. Protection against exposure
23. Structural improvements
24. Fire retardant treatments
25. Prevention of water damage
26. Public fire protection
27. Public water supplies
28. Fire pumps
29. Tanks
30. Private protection, outside
31. Standpipes and inside hose systems
32. Fire extinguishers
33. Automatic sprinkler protection
34. Types of automatic sprinklers
35. Dry pipe and non-freezing sprinklers
36. Special types of sprinkler systems
37. Water flow sprinkler alarms
38. Sprinkler inspection and supervision
39. Sprinkler maintenance problems
40. Sprinkler leakage
41. Outside open sprinklers
42. Smothering systems
43. Signaling systems
44. Self inspection of fire equipment
45. Private fire organizations
46. Salvaging operations
47. Exits
48. Protection of records and valuables
49. Hydraulic calculations and tests

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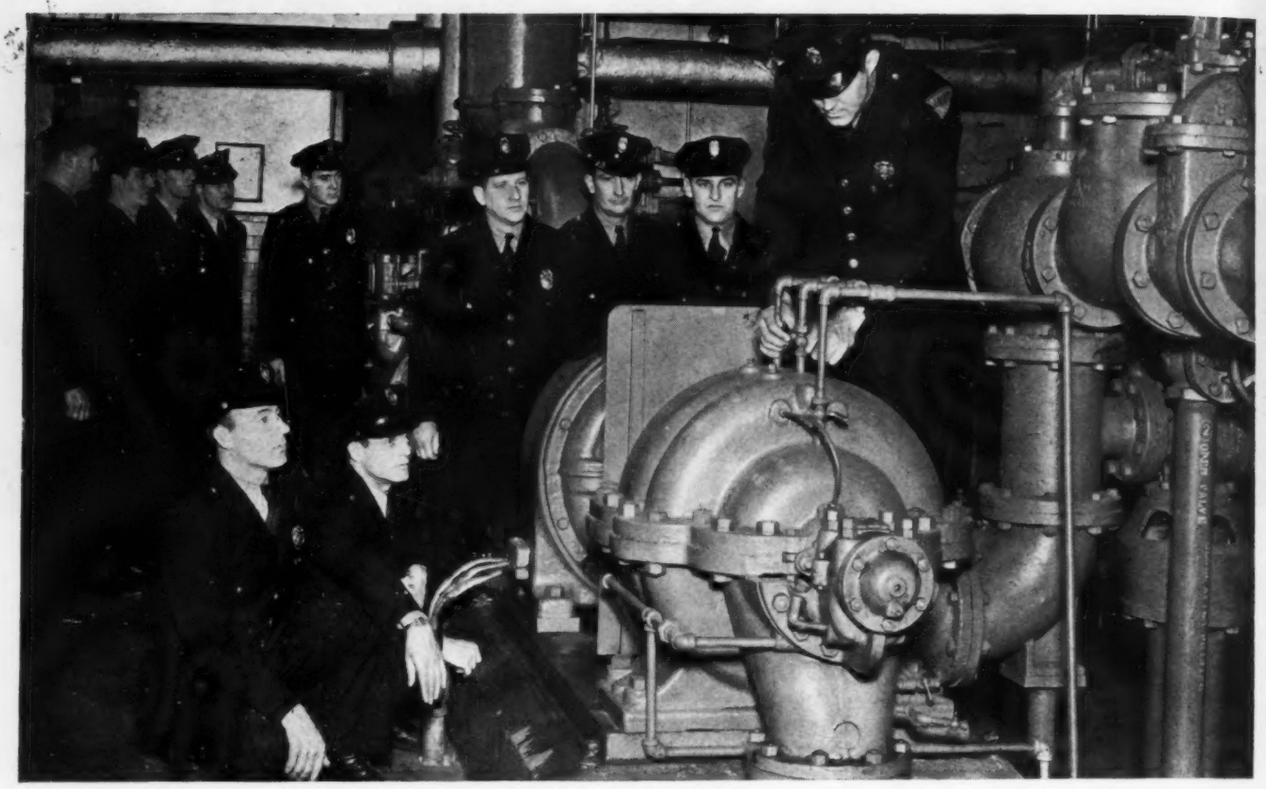
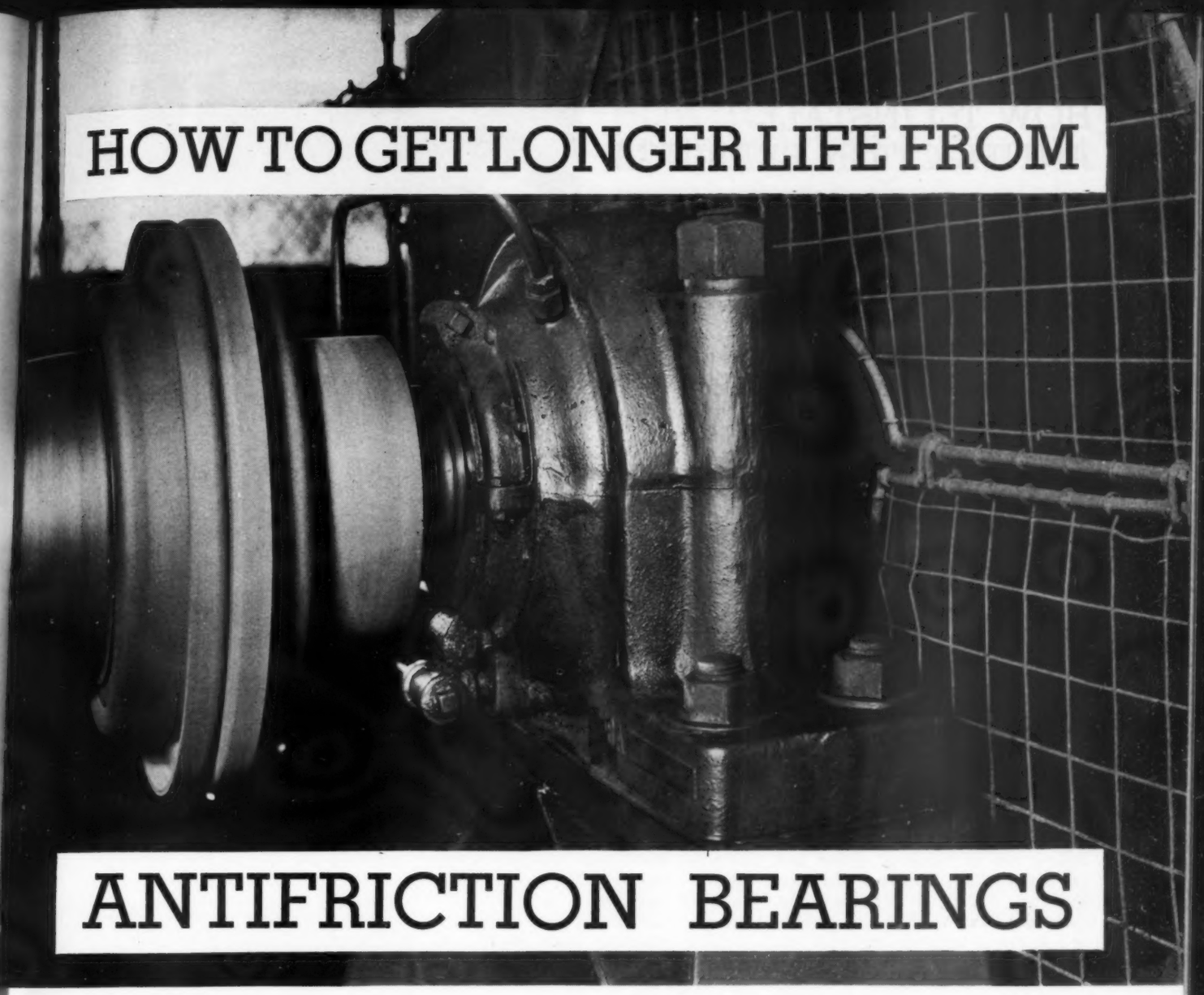


Special equipment, such as fire pumps, standpipes, hydrants, hose houses, is thoroughly discussed and demonstrated. Members of the patrol force are instructed in the operation of steam and electric-drive fire pumps. All valves are plainly marked in their proper sequence to prevent mistakes

Patrolmen are taught all about such special hazards as acetylene generators, spray booths, lacquer and paint storage. Part of their job is the careful inspection of all danger spots



HOW TO GET LONGER LIFE FROM ANTIFRICTION BEARINGS

Hard work, long hours, don't hurt antifriction bearings if conditions are right; it's abuse—rough handling, improper installation, neglect—that leads to failure

G. PALMGREN, Chief Engineer, SKF Industries, Inc., Philadelphia

PRESENT DEMANDS for bearings and alloy steels make it imperative that every user of antifriction bearings get the maximum service and life from these bearings because it is not an easy matter to obtain replacements when they fail.

Antifriction bearings are both rugged and delicate. They will withstand for long periods the punishment imposed by the service for which they are designed, when properly cared for. On the other hand, they are quite vulnerable to many forms of abuse, some of which are not always recognized as such. As a result every user has it in his power to decide whether bearings will give long, satisfactory life, barring accidents that injure or destroy them, or whether they will fail within a few months or days.

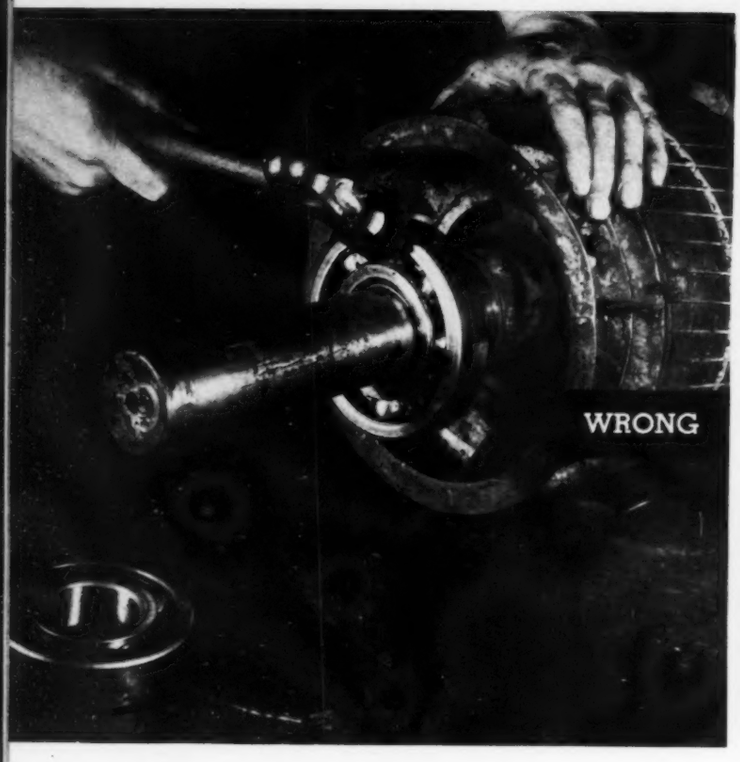
Need for proper care of a bearing begins as soon as it is delivered to the plant. Assuming that it has not been built into some machine, it comes from the factory perfectly clean, protected from rusting by a thin coat of slushing compound, and carefully wrapped to exclude moisture and dirt. Before it is unwrapped, however, a bearing can be easily damaged by being tossed on a bench or shelf, or allowed to fall. Therefore:

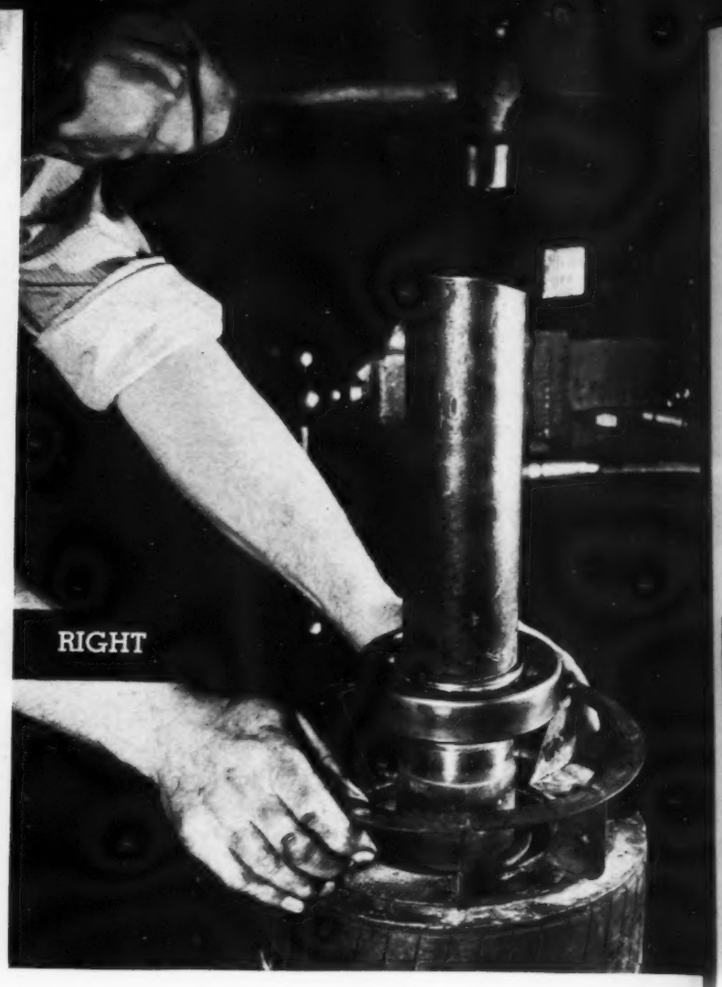
1. Handle bearings carefully.
2. Store in a clean, dry place.
3. Do not remove the wrappings until ready to install bearings.

Failure to take certain elementary precautions when installing a bearing may result in damage that will cut the life to a fraction of what it should be.

In the majority of applications of antifriction bearings, the inner race must fit on the shaft tight enough so that the race will revolve with

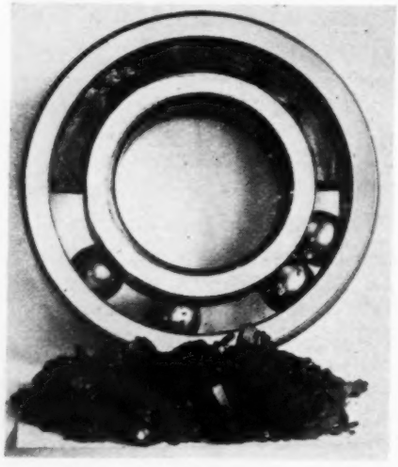
HOW TO INSTALL ANTIFRICTION BEARINGS





the shaft. The heavier the load, the tighter the fit required. Races that are loosely fitted will peen and score the shaft, making the fit still looser, and ultimately leading to trouble. When the fit between the inner race and the shaft is too tight, expansion of the inner race will subject the bearing to an excessive preload, resulting in early failure.

When mounting an antifriction bearing on the shaft, the outer race must never be pounded or subjected to more force than can be exerted by the hand. Pounding on the outer race will inevitably produce flat spots on the balls and brinell the races, possibly cracking the outer race. Brinelling the raceways will result in noisy bearings, and the life of the bearings will be materially reduced.



Failure of this bearing was due to flour, which combined with the lubricant to form a hard mass

Force a bearing over the shaft by using an arbor press or by tapping on the end of a piece of pipe; in either case apply the force against the inner race. Heating a bearing to say 150 to 200 degrees Fahrenheit is a commonly used method so that the inner race will slip easily over the shaft. Care must be taken, however, not to overheat the bearing.

The shaft shoulder for the inner race must be large enough to make suitable contact; at the same time the shoulder should be small enough so that contact with the inner race can be made when removing the bearing from the shaft. Remove all nicks or burrs from the face of the shaft shoulder. Unless the inner race makes contact all around, the bearing will be out of square with the shaft axis, resulting in premature bearing failure.

The outer race is usually mounted with a clearance fit in the housing. With split housings make certain that the outer race is not pinched. Avoid switching the caps of split housings, because they are seldom made to be interchangeable.

When removing bearings that are still good, take every precaution not to damage them. Preferably, bearings should be forced off the shaft by a press or drawbar and plate, exerting pressure against the inner race. If this procedure is not possible, and the bearing must be removed by applying pressure against the outer race, it is possible in many cases to prevent damage if the outer or inner race can be rotated while the pressure is being applied.

Whether bearings are being installed or removed, keep dust and dirt from getting into them. Dirty hands and tools, or a dirty atmosphere can be the means of introducing enough abrasive matter into the bearing to cause trouble. Of course, exposure to a steamy atmosphere or corrosive fumes can cause rusting within a very short time.

Care in handling during installation of antifriction bearings will do a great deal to eliminate some of the common causes of failure, but it cannot do away with all causes. In service, bearings obviously are often exposed to adverse conditions, some brought about by neglect.

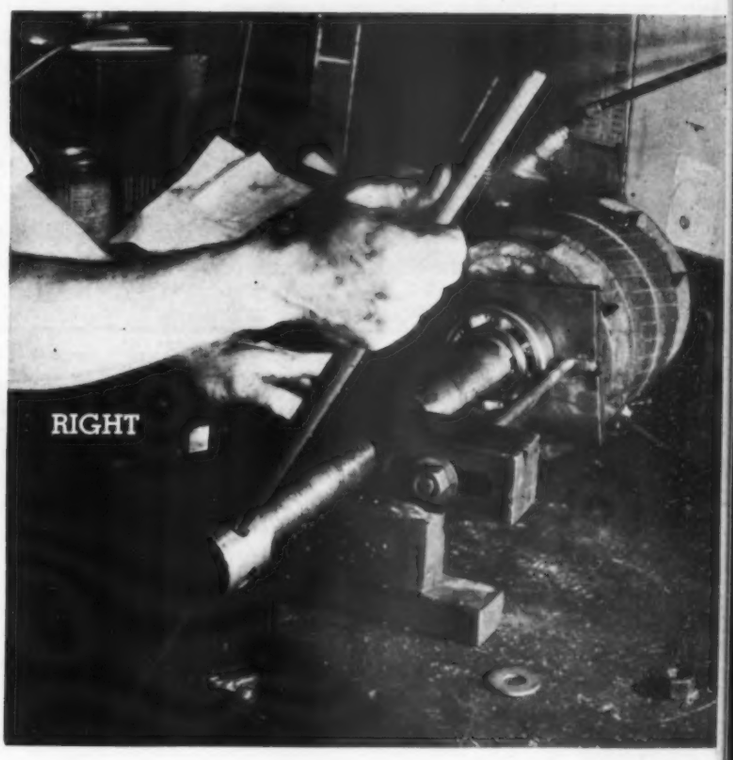
DON'T force a bearing into place, top left, by pounding on the races. It will injure them as well as the balls or rollers

DO install bearings with a press, or by tapping on a piece of pipe or tube, left, in contact with the inner race

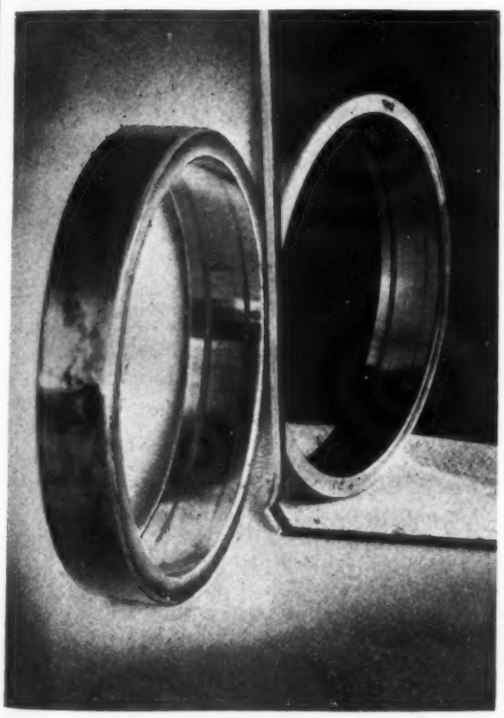
DON'T let bearings lie in the dirt, below, or be exposed to moisture or fumes. Protect carefully before and after installation

DO use a drawbar and plates, right, or a press to remove a good bearing. Exert pressure only against inner race

HOW TO REMOVE ANTIFRICTION BEARINGS



THESE ARE ENEMIES OF ANTIFRICTION BEARINGS



Flaking of this outer race was due to overloading because it was pinched in the housing

Misalignment and Improper Loading

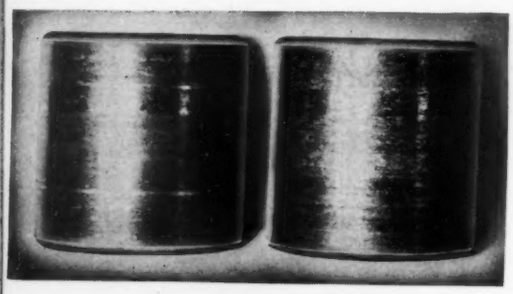
When a bearing of a type that is not inherently self-aligning is out of square with the shaft, the balls or rollers may be pinched or cramped. Overloading naturally follows, causing flaking or spalling of the races as well as the rolling elements, and complete failure soon takes place. Only when self-aligning bearings are used can slight misalignment be permitted.

Antifriction bearings are subjected to two kinds of load—radial and thrust. On some applications both types are present. With a few exceptions a radial ball or roller bearing can take thrust loads, but thrust bearings can handle little or no radial load. Radial bearings often fail or are damaged because they have been subjected to an excessive thrust load. Expansion of a shaft lengthwise, for example, may bring about this condition if the bearings are improperly mounted. It can happen if more than one bearing on the shaft is restrained from moving in the housing in a lateral direction, either because the housing fit is tight or insufficient lateral space is provided in the housing to take care of shaft expansion. When an unforseen thrust load is added to a bearing that is already carrying radial load, the balls and rollers are subjected to additional forces that often result in early fatigue failure. Thrust loads due to natural operating conditions are usually taken into account in the bearing design, and the bearing type and size selected accordingly. Provision must likewise be made to relieve thrust bearings from any radial load.

Antifriction bearings should be selected to have a margin of safety that will be ample under all ordinary conditions. Failure to do so may again result in overload and failures, and trouble from this cause is not rare. Under these conditions fatigue of the metal takes place within a period depending roughly on the extent of the overload. Whenever operating or load conditions are changed, make sure that the bearing has a sufficient margin of safety to accept the change.

CONTINUED ON NEXT PAGE

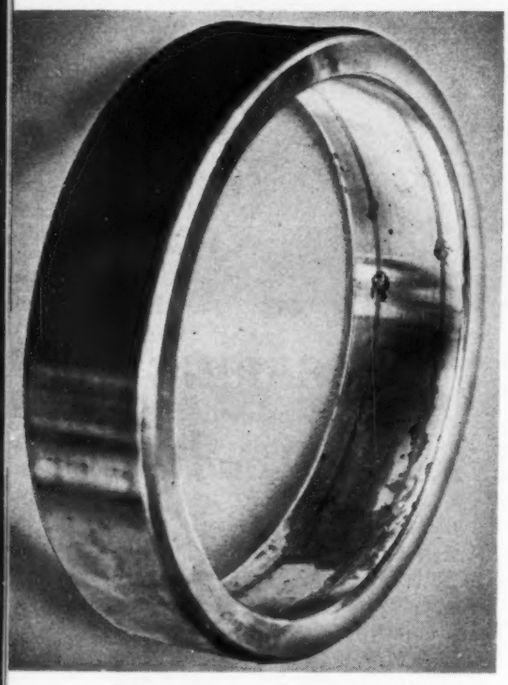
Improper Lubrication



Lack of lubrication resulted in smearing of these rollers

Antifriction bearings do not require much lubrication, but a certain amount is essential. Neglect of this requirement is a fairly common cause of failure. On the other hand, too much lubricant leads to heating and other troubles. The necessary frequency of lubrication depends on speed and other operating conditions, therefore it is advisable to follow instructions. The importance of using only high-grade lubricants of the proper type and consistency can hardly be overemphasized. Here again it is wise to follow the recommendations of the bearing or lubricant manufacturer. Serious bearing trouble may be the penalty for failing to do so.

Corrosion, Etching, Pitting



Corrosion causes etching, pitting of bearings, with early failure

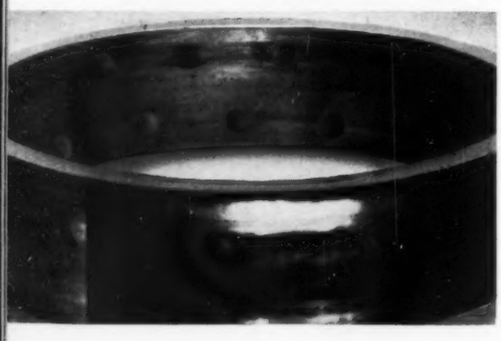
In the manufacture of antifriction bearings a great deal of care is used in giving the races and rolling elements a flawless, highly polished surface. Such a surface is essential for long life and trouble-free operation. On the other hand, it can easily be damaged or destroyed by corrosion, which may originate in several ways. For example, inferior or improper kinds of lubricants can cause corrosion. Again, when a bearing is idle for a long period a chemical change known as oxidation may take place in the lubricant, with the formation of acids. These acids will attack the highly polished surface of the bearing, causing stains, etching, and pitting. When a bearing in this condition is called upon to carry a load, flaking of the surfaces develops rapidly and failure will soon follow.

Corrosive fumes will attack a bearing that is not properly protected, which again will impair the bearing life. Entrance of water into a bearing, or operation without proper protection in a highly humid atmosphere, will result in corrosion and early destruction of the bearing. Another form of pitting that is sometimes found in the bearings of motors and other rotating electrical equipment is caused by the passage of electrical current.

A grounded winding or coil and possibly other conditions may raise the potential of the motor shaft. Under these conditions there may be a leakage of current through the bearings to the frame or pedestals and then to ground. Pitting, and possibly serious heating of the bearing elements, may take place and the door is open wide for premature bearing failure. Prevention and cure of such troubles lie in the field of the electrical expert. They are mentioned here, however, as a possible clew to pitting for which no other suitable explanation can be found.

If it appears that antifriction bearings are unduly delicate, just remember that all the causes of trouble and failure described herein can be easily avoided by proper care in handling during installation and intelligent attention while they are in service.

Dirt and Foreign Matter



Abrasive matter and vibration caused these deep depressions

Well-designed bearing housings are provided with adequate and effective inclosures to retain the lubricant and keep out dirt and other foreign matter. If these defenses are improperly designed or lose any of their effectiveness, bearing trouble is not far away. Even though the design is satisfactory dirt may get into a bearing while it is being installed or during repairs, or it may be present in the lubricant. Regardless of how it finds its way into a bearing, dirt acts as an abrasive and tends to grind metal away from the races or balls or rollers. The result is a loose bearing, which not only invites vibration, but is deficient in load-carrying capacity, and consequently the life of the bearing is impaired. Normal life cannot be expected from a bearing into which dirt has found its way.

Do's and Don't's in Starter Maintenance

Motor starters are more important than ever. When they fail, production falls and vital war orders wait. Keep the starters starting by applying simple rules

W. W. McCULLOUGH, Service Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh

EACH STARTER for a squirrel-cage induction motor consists of a contactor or a switch, with suitable protective relays, used alone or in combination with an autotransformer, a resistor, or a reactor. Keep in mind these fundamental parts when planning a maintenance schedule.

Be sure that all disconnecting switches are open and that all circuits are dead before opening any starter for inspection or repairs. Do not take a chance; play safe. Although the voltage may be low, your own life and the lives of others may depend on you.

Manual starters for full-voltage starting of squirrel-cage motors are available for machines up to approximately 200 horsepower. The quick make-and-break starter, with toggle operating mechanism, and the drum type are used to connect motors directly to the line. Manual across-the-line starter operating mechanism consists of a set of contacts, an arc box, a set of overload relays, a base, and an inclosure. The drum-type unit provides no overload or low-voltage protection.

The oil-immersed drum starter is usually installed where the air may become charged with corrosive gases or highly flammable particles of dust or lint, as in textile mills, flour mills, and woodworking plants. The drum type is frequently used for reversing service, and for smaller multi-speed squirrel-cage motors.

Magnetic across-the-line starters all perform the same general service and are operated by built-in or separate pushbuttons, or by master switches. Such a starter has an operating magnet, a set of contacts, an arc box, a set of overload relays, insulating supports, a base, an inclosure, and, frequently, undervoltage releases.

A pushbutton or master switch energizes the magnet that closes the contacts, and an interlock. The starter remains closed until pressure on the stop button releases the interlock.

There are several types of magnets used in across-the-line starters. The "clapper" type has a hinged armature which is pulled against the magnet core, and uses at least one bearing.

Silver-to-silver contacts are now used almost universally on starters. This is because contacts oxidize under the severe heat of an arc, and silver is one of the few metals the oxide of which is a good conductor. Older starters, for the most part, have copper-to-copper contacts.

W. W. McCullough, University of Texas—electrical engineering, 1909.

A year in engine rooms of seagoing dredges and cutter dredges operating in the Gulf of Mexico.

A year with the famous Tellurive Power Company in Colorado, operation of high head power plants and transmission system serving 9010 mines.

Three years in Florida — construction and operation of a low head water power plant and transmission line.

Westinghouse since 1914. Test department — field engineer attached to service department

Wide Range

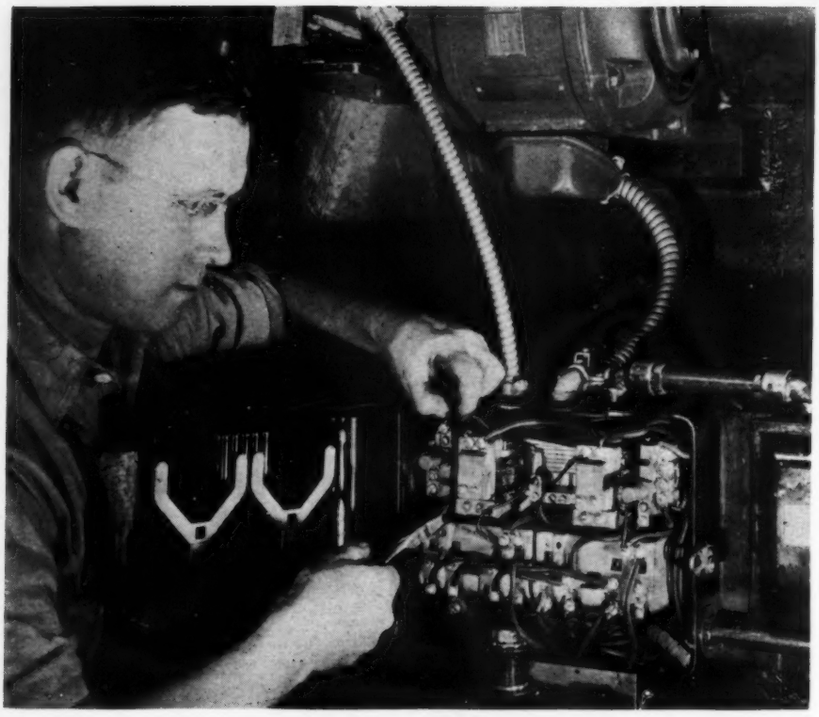
Full-voltage starters can be used over a wide range of horsepower and voltage provided, first, that the design of the motor is such as to permit throwing the windings directly across the line voltage; second, that the capacity of the circuit, and the power company's regulations, allow the resulting current inrush.

Reduced-voltage starters can be either of the autotransformer type or of the resistance type. They find extensive application wherever the size of the motor or power company restrictions require starting on reduced voltage.

The autotransformer type is a practical starter, providing complete protection for the motor load and high starting torque per ampere drawn from the line. The following table shows the percentage of full-voltage torque obtained at various percentage taps on the autotransformer:

Line Voltage	*Percentage Full-Voltage Torque*
50	25
65	42
80	64
100	100

Resistance starters are often applied on network distribution systems where power company regulations require that the circuit be kept closed during the transition from reduced voltage to full voltage. They are par-



Routine inspection of reversing across-the-line starter used on a multiple punch press. Two connectors are directly above the relay

ticularly useful in avoiding sudden mechanical shock to the driven load.

In manual starters it is obvious that a slow-break opening of contacts causes serious arcing and shortens contact life. It is equally true, but not so obvious, that a slow-make closing of contacts can do the same thing. If contacts come together slowly, they begin carrying the heavy starting current before full contact pressure has been reached.

The toggle mechanism must be kept in good condition to preserve the quick make-and-break operation. In spite of lubrication, wear takes place; replace badly worn parts of the mechanism and see that the action is "snappy." Keep a supply of new contacts available for replacing those worn or badly pitted.

Most industrial full-voltage starters are provided with overload relays whose action depends on the movement of a bimetallic strip under heat. Overload protection can be either bimetal-relay or solder-pot type. Be sure to tighten all relay connections in order to maintain original calibration. When resetting solder pot relays, wait until the solder has thoroughly solidified, otherwise the shaft may not be firmly held.

On very small motors the bimetallic strip actually carries the motor current, but on larger ones a separate heater carrying the motor current is placed close to the strip. On still larger motors a current transformer reduces the motor current to a value that can be handled by the heater.

These thermal relays have the inverse-time-limit feature, which means that the greater the overload the shorter the time of tripping. They provide excellent protection against overloads and momentary surges but do not protect against short circuit currents.

Heaters for thermal relays are made with different current ratings so that, within its limits, any starter can be used with different sizes of motors and still afford protection by using the proper size of heater. Tables showing the ampere ratings of heaters can be obtained from the manufacturers. In general, the ampere rating of the heater should be approximately 120 percent of the motor full-load current.

Using Calibration Lever

A further adjustment is possible by a calibration lever on some types of relays. When set at 100 percent, the current stamped on the heater will just trip the starter after several minutes. For tripping at a smaller current, move the lever toward 90; at a larger current, move it toward 120.

For protection against short circuits, circuit breakers or fuses should be installed ahead of the starter. Where fuses are used, it is good practice to use a disconnecting switch as well.

Maintenance of magnetic across-the-line starters demands that the following instructions be followed:

1. Do not lubricate contact tips or bearings.

2. Wipe magnet sealing surfaces oc-

GENERAL RULES FOR STARTER MAINTENANCE

1. Follow the manufacturers' instructions
2. Inspect starters periodically
3. Keep equipment clean
4. Replace badly worn contacts at once
5. Maintain proper contact spring pressure
6. Replace insulating oil when necessary
7. Do not use emery to smooth contacts; a file is recommended
8. Keep all connections tight at all times

casionally with an oil-moistened cloth; this prevents rust and noise.

3. Check tightness of all connections. Pay particular attention to overload heater connections because looseness there will cause local heating and affect the calibration of the relay.

4. Make sure that shunts are not broken or touching other parts.

5. Adjust contacts so that they will all make simultaneously.

6. Replace contact tips if they become extremely rough or burned in service.

7. Remove deposits from the surfaces of arc boxes or barriers. Replace broken parts.

8. Make all moving parts work freely.

9. Disconnect motor and manually test the start button, the stop button, the overload relay, and reset.

The maintenance requirements listed for across-the-line starters apply also to reduced-voltage starters, commonly known as autostarters. In addition, check the following points:

1. Adjust the low-voltage release mechanism so that it works freely.

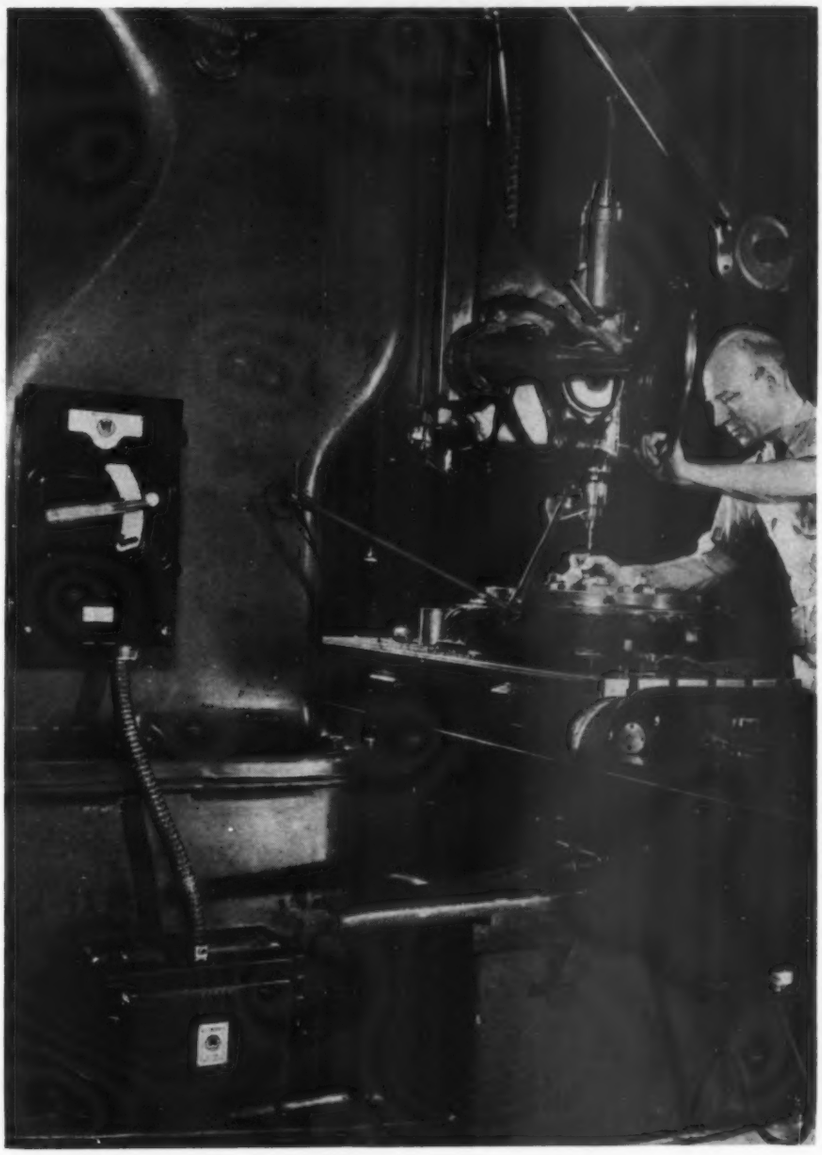
2. Many of these starters use an overload relay of the magnetic type having an oil dashpot to prevent tripping on momentary overloads. See that the piston is not binding in the dashpot and that the dashpot is filled, to cover the piston, with the proper grade of oil. Use only oil recommended by the maker; it should be specially refined to have a flat viscosity-temperature curve.

3. Check the setting of the overload relay; it should be at least 125 percent of full-load motor current.

4. Where oil is used, fill the pan to the proper level. If the oil becomes badly discolored or carbonized from service, replace it with new oil after carefully cleaning the pan.

5. In automatic starters of the autotransformer type, a definite time relay is used to control the time on the starting tap. The timing of this relay should be checked and, if an oil dashpot is used, keep it filled with oil. Use only oil recommended by the manufacturer; it should be a light oil with pour test suitable for use in low temperatures.

6. Starting transformers are provided with taps by which the starting voltage can be varied. The proper taps to use are those that bring motors of 100 horsepower or less up to speed in 15 seconds or less. On larger motors, the starting period may be 30 seconds. Longer starting periods may seriously overheat, and therefore damage, the transformer.



The relative positions of a full-voltage starter, below, and a breaker, above, are shown on this giant jig-borer

Keep drum starters clean, replace worn contacts, and watch out for carbonized barriers and insulating parts. If oil is used, replace as soon as carbonized.

Resistance starters usually employ drum controllers, or contactors, to reduce continuously or by steps the resistance inserted in the circuit. As the resistance is cut out, the motor comes up to speed. Full speed is reached when the resistors are short-circuited in from one to ten seconds. The starting cycle should not be more frequent than once in 80 seconds.

Maintenance requirements are covered, in general, by the preceding sections. The following added points are important:

1. Inspect resistors periodically.

2. Check all starter connections for tightness.

3. Blow out accumulated dust and dirt at definite intervals.

With Right Care, Conveyor Belts Will Carry On

Part II. Constant watchfulness, correct cleaning, removal of hazards, and prompt repairing, will prolong the life of that difficult-to-replace conveyor belt

P. D. SULOFF, Mechanical Goods Development, The Goodyear Tire & Rubber Co., Akron

LAST MONTH training conveyor belts, importance of proper loading, and protection at skirt boards were discussed. Here the hazards to belts are mentioned, and a suggested program of inspection and repair is offered.

Belts should be run with just enough counterweight, on the take-up, to keep the drive from slipping under the worst conditions. Bends around terminal pulleys are much less severe when made under low tension. In long conveyors these bends are infrequent and increased belt tension can be tolerated if there are other advantages. The power required to run a level conveyor is not fully accounted for by bearing friction of carriers and terminals. Work is being done on both the belt and material carried as they are reshaped at each carrier.

A study of the power requirements of a series of conveyors showed that those units with greater tension and closer idler spacing required slightly less power than average. If the belt sags between idlers and spills material through the low tension portions of the conveyor, additional tension may do more good at these points than it will do harm at others.

Tension Control

Control of tension is extremely important and can best be accomplished by counterweighted take-ups. Screw take-ups provide an unknown tension that varies continually. Screw take-ups ignore the continual change in length of cotton belts, whereas a counterweight maintains the predetermined tension.

Many damp materials tend to stick to the belt and build up on pulleys or rolls. Material on return rolls may affect the training of the return run and cause edge damage. Lumps on pulleys can cause extreme local tension in the fabric and actually break outer plies of duck. Lumps of material bouncing onto the return run may be carried to the tail pulley and forced through the belt. To prevent this damage the top of the belt can be scraped, brushed, or washed before it enters the return run. Plows can be provided to remove any stray lumps riding back on the inside of the return run, and scrapers can be provided on pulleys to remove knobs.

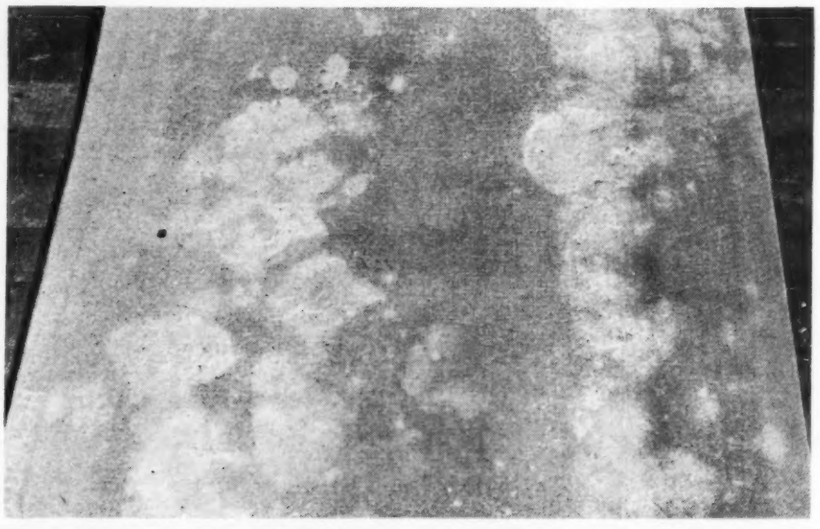
Cleaning the top surface of the belt is a problem requiring individual solution. Scrapers and brushes are widely used but wear rapidly and require replacement. Washing has been found satisfactory in some cases. As it leaves the head pulley, the belt is sprayed by a row of nozzles covering the width of the belt. After the spray, a rubber wiper removes the remaining material and the excess water.

Lagged drive pulleys are commonly used and permit the belt to be driven with less tension. Satisfactory laggings are rubber and fabric bolted to the pulley, but they must be kept tight and replaced when worn. Loose bolts, or laggings worn so that bolt heads are exposed, can damage the pulley surface of the belt. Rubber belts with wet pulley surfaces are likely to slip even on lagged pulleys. Under such conditions, down-hill belts may run away damaging belt and equipment, while level or uphill belts are difficult to start and may be damaged by the excessive slip. Grooved rubber laggings have been found to be an effective remedy for this condition.

Lagging has been used occasionally, on pulleys other than the drive, as a means of keeping pulleys clean. Tapered laggings to reduce or remove the effect of the drive pulley crown have also been used.

External Hazards

Heat, light, and air are the factors producing the aging of rubber compounds. Aging no longer has a great influence on the life of conveyor belts. However it is still desirable, on perma-



Carcass of cotton duck belt damaged by mildew caused by moisture, darkness, or long periods of uniform temperature

nent conveyor installations, for belt and equipment to be inclosed in a gallery.

Grease and oil are extremely detrimental to rubber compounds. Grease from idler bearings or drip from the grease gun hose can swell and loosen patches of pulley cover and seriously damage the pulley side of the belt. Small quantities of oil, if present in the material carried, are absorbed by the belt cover and may swell the cover until the belt will not "trough" and cannot be kept trained. Special belts of synthetic compounds can be obtained for these jobs.

Hot materials handled on conveyor belts may require the use of synthetic compounds or heat-resisting rubber compounds.

Mildew will seriously reduce the strength of cotton belt duck and cause local breaks in the carcass. Mildew usually occurs when the duck is damp, the temperature uniform and not too low, light is excluded by the belt covers, or there may be no light, as in underground operations. If these conditions are present, protection can be provided by the use of mildew-inhibiting agents in the manufacture of the belt, and by the regular repair of cover damage which penetrates to the carcass.

In many mining operations, tramp iron is loaded with the intended material. Lengths of rail, picks, and spikes by the keg, are found. Removal of this material magnetically or detection of it electrically may prevent a costly accident to the belt.

Many concave vertical curves are designed so that the belt is at the point of lifting from the idlers under the maximum running tension. Under starting tension, or other conditions worse than originally contemplated, the belt lifts through the curve when not loaded. In some cases the return run may have greater tension than the top run and rise up against the conveyor structure or decking. If the belt lifts up, be sure it has a spare return roll to run against rather than have it drag.

Convex Curves

Convex vertical curves are sometimes put in with the entire change in grade made over three or four idlers. This not only puts extra load on the idlers but also causes excessive tension in the edge of the belt. The minimum radius of curvature should be 55 times belt width. This governs only as a minimum. At points of high tension much longer curves may be necessary. The first idler after the tail pulley and the last idler before the head pulley should be set a full normal idler space from the pulleys to allow the belt to change section without excessive tension at the edges.

Weight carriage of take-up device (at extreme top) might be derailed by conveyed materials. Derailment would cause considerable damage

Some of these hazards, and probably a few others, will show up and can be corrected if regular inspection is made. Provide an inspection and repair station with good lighting and a control button so the belt can be jogged along a few feet at a time. This station should preferably be at the point of greatest tension, as any carcass damage is more apparent when the belt is under tension.

Watch for any continued marking or scratching of the belt surface on top, bottom, and edges, and trace them to the point in the system at which they originate.

Watch for cutting and gouging of the cover and repair any that penetrate into or near the carcass. These cuts and gouges are usually the result of chute or skirt board imperfections. Do not forget the inspection of the pulley cover as well as the top cover.

The carcass can be damaged with no cut or mark of any kind visible on the cover. These breaks are often more evident from the pulley side. The belt tension pulls them slightly open and the cover is drawn into the gap, forming a depression on the belt surface. Such breaks usually result from improper loading of heavy lumps or of lumps being carried between belt and pulley.

Repair of cover cuts with self-curing repair dough is practiced to some extent and is fairly satisfactory. Vulcanized repairs, using small electric vulcanizers for curing, are permanent and more satisfactory. Carcass breaks can be held together temporarily with metal plates but should have a permanent vulcanized repair at the first opportunity. In making carcass repairs of any size, the belt should be relieved of tension so that an equal distribution of load is obtained in the region of the repair.

To Keep Little Motors Going When the Big Motor Starts

Conclusion of the article. The first part told why even a small drop in system voltage may cause trouble. Here are some ways to avoid objectionable drops

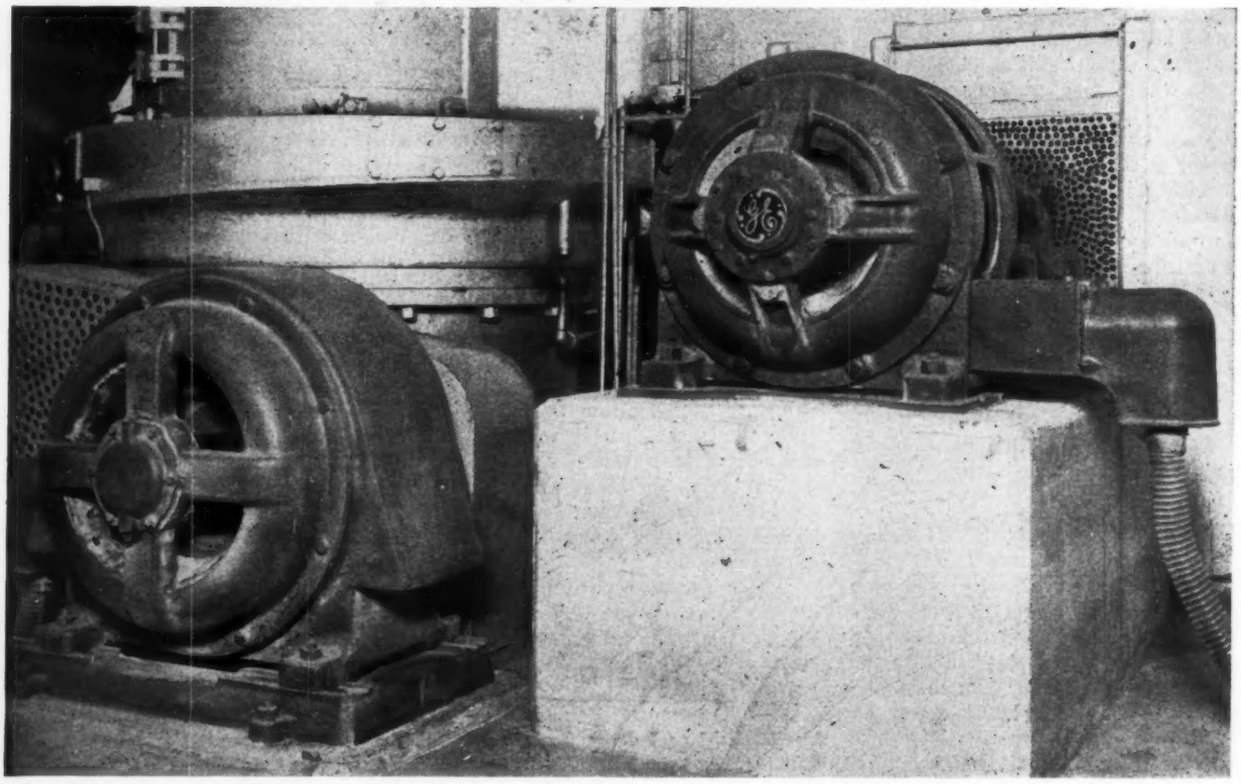
W. K. BOICE, Industrial Engineering Department, General Electric Company

THE STARTING TORQUE that a motor develops is proportional to the square of the voltage at the motor terminals. Thus, at half-voltage a motor will develop only one-quarter of the torque it will develop at full voltage. The full-voltage starting torque is dependent on the motor design and is usually expressed as a percentage of the torque delivered by the motor at full load, full speed. Torque required for starting is dependent on the type of load the motor drives. Hence for each motor application, regardless of the method of starting used, the voltage at the motor terminals must be above a certain value to make starting possible.

If the excitation of the generator is not changed, as by regulators or hand control, the minimum value to which the load reduces the voltage must not be so low as to be inadequate for starting the motor. To maintain sufficiently high minimum voltage without a regulator would ordinarily require so large a generator that the use of a regulator is nearly always justified.

When voltage regulators are used the permissible minimum voltage is not limited by torque requirements. The motor will start if the regulator can restore the voltage to an adequate value.

Occasionally, with high-speed motors driving loads that increase rapidly as the speed rises, such as 3600-r.p.m. motors connected to centrifugal pumps, a power system or a starting method that can provide voltage high enough to start the motor may nevertheless not provide voltage adequate to allow it to accelerate to full speed. Such cases require special care.



Motors that start under load after an unplanned shutdown present a starting problem when the system capacity is limited. The motor at the left, driving a coal pulverizer, is a good example

Special Limitations. The presence of x-ray equipment, or of certain types of lamps that may go out on slight undervoltage, or other special conditions, may determine the allowable minimum voltage.

Commonly used methods of starting motors are:

1. Full-voltage starting.
2. Reduced-voltage autotransformer starting.
3. Resistor starting.
4. Reactor starting.
5. Secondary-resistance control (of wound-rotor motors).

Squirrel-cage induction motors are commonly used in three types, designated as:

1. Normal starting current, normal starting torque.
2. Low starting current, normal starting torque.
3. Low starting current, high starting torque.

Use of a motor of either the second or third of these types may help to meet the requirements of a particular system. Usually, however, the reduction in starting current made possible by selecting a motor of either of these two types is less than the reduction obtainable by the use of reduced-voltage starting.

Initial Loads. If the generator is already carrying a load when a motor is started, this initial load will have an influence on the voltage dip. The extent of this influence will depend on the amount of the other load, on its power factor, and on its character (whether induction or synchronous motors, lighting, and so on). Initial loads may either accentuate voltage disturbances or reduce them. The effect of motors previously connected depends on the percentage of rating to which the motors are loaded. Effect of initial loads not exceeding about 25 percent of the generator rating can usually be neglected.

Lines, Cables, Transformers. Wherever it is appreciable the voltage drop in lines, cables, and transformers connecting motors to generators should be given consideration. Cable runs of not more than 50 feet per 100 volts of circuit voltage may usually be neglected.

Motor Synchronization. Because synchronous motors start and run as induction motors up to the time field is applied, their starting requirements during this period are similar to those of induction motors. At the end of the starting period when synchronous

Characteristics of Motor Starting Methods*

Type of Starter (Settings given are the more common for each type)	For 100 Percent Line Voltage			Minimum Generator Kva. ÷ Motor Horsepower Rating		
	Line Current ÷ Full-Voltage Starting Current	Motor Voltage ÷ Rated Voltage	Available Starting Torque ÷ Full-Voltage Starting Torque	**K = 4	K = 6	K = 8
Full-Voltage Starter	1.0	1.0	1.0	4.0	6.0	8.0
Autotransformer tap						
80 percent	0.67	0.80	0.64	2.7	4.0	5.6
65 percent	0.45	0.65	0.42	1.8	2.7	3.6
50 percent	0.28	0.50	0.25	1.1	1.7	2.2
Resistor starter, single step (Adjusted for motor voltage to be 80 percent of line voltage)	0.80	0.80	0.64	2.8	4.2	5.4
Reactor tap						
50 percent	0.50	0.50	0.25	2.0	3.0	4.0
45 percent	0.45	0.45	0.20	1.8	2.7	3.6
37.5 percent	0.375	0.375	0.14	1.5	2.2	3.0
Wound-rotor motor multi-step control (Starting current limited to 150 percent of motor rated full-load current. Torque available during acceleration, 100 percent)	.....	1.0	.....	.....	1.0	.....

* This table applies when: Standard 0.8-power factor generators are used. Initial load on generators does not exceed 25 percent. Voltage regulators control all generators. Generator voltage does not fall below about 75 percent. Voltage drop from generators to motors is negligible.

Under these conditions regulators will restore generator voltage to substantially 100 percent for meeting starting torque requirements.

***K* = Motor Full-Voltage Starting Current ÷ Motor Full-Load Current.

In some cases, when complete data are available, study may show that satisfactory starting can be obtained with generator sizes smaller than those indicated in this table.

motors are up to speed and connected directly to the line, and field excitation is applied, they must be able to pull into step with the system frequency.

To assist in the selection of synchronous motors, manufacturers publish values of pull-in torque. These values apply to synchronization at full voltage and specified values of load WR^2. Data are also published as to the increase in pull-in torque that may be required when the load WR^2 exceeds the published normal value.

If the voltage at synchronization is less than the rated voltage of the motor, the ability of the motor to synchronize is reduced. The torque against which a motor will pull in a given WR^2 varies approximately as the square of the voltage. Thus, for a given WR^2, a motor with 95 percent applied voltage will pull in against only 90 percent as much torque as it would if full voltage were applied.

The current drawn by a motor just before synchronization is appreciably less than the full-voltage starting current. At the time of synchronization the generator voltage has ordinarily been restored to normal by regulator action. Therefore any voltage drop at this time will usually be that in the lines, cables, or transformers supplying the motor.

Examples Show How

From the foregoing it is obvious that many factors may need consideration when selecting generating equipment, motors, and motor starters for operation on power systems of limited capacity. The table (page 119) will help in making proper selections, when the operating conditions are relatively simple. In it are included the specific but necessarily approximate data needed in making the calculations that determine the selection of the equipment. Note, however, that the data apply only for the operating conditions listed in the table.

The results obtained by using the table may be approximated by applying this rule: *The starting current drawn from the line should not exceed the sum of the rated currents of the generators.*

How the table is utilized in solving typical problems is illustrated in the examples that follow.

EXAMPLE 1. Determination of Starting Method and Minimum Generator Size.

It is desired to start a squirrel-cage induction motor under the conditions listed in the table when:

Motor horsepower = 50

Full-voltage starting current = six times full-load current

Full-voltage starting torque = 120 percent of full-load, full-speed torque

Starting torque required = 50 percent of full-load, full-speed torque

Hence,

Starting Torque ÷ Full-Voltage Starting Torque = 50 ÷ 120 = 0.42 (minimum allowable)

From the table it will be seen that the use of an autotransformer type of starter set on the 65 percent tap would result in,

Starting Torque ÷ Full Voltage Starting Torque = 0.42

Therefore this type of starter would make adequate starting torque available, after the voltage has returned to normal.

For this starter and tap the minimum generator kva. is determined from the table as follows:

Since the full-voltage starting current of the motor was assumed to be six times its full-load current, the formula for K at the bottom of the table shows that,

$$K = 6$$

In the column under the heading K = 6 it will be noted that with an autotransformer starter on the 65 percent tap,

Minimum Generator Kva ÷ Motor Horsepower = 2.7

Hence,

Minimum Generator Kva. = 2.7 × 50 = 135

All the other listed standard types of starters and settings are seen to require more generating capacity or provide less torque than the method and setting chosen.

EXAMPLE 2. Selection of Type of Motor.

It is desired to start a 100-hp., 440-volt, 1800-r.p.m. squirrel-cage induction motor from a 625-kva. generator under the conditions outlined in the table, when:

Starting torque required = 140 percent of full-load, full-speed torque. This value includes not only the torque required to overcome friction and start the driven load but that required for acceleration as well.

The type of motor is selected by successive trials using the table as follows:

1. For the first trial, assume a normal-starting-torque, normal-starting-current motor of the given rating. Published data on such a motor reveal that:

Full-voltage starting torque = 150 percent of full-load, full-speed torque, and

$$K = 7.3$$

Since for this motor the full-voltage starting torque (150 percent) is so little in excess of the required starting torque (140 percent), it is immediately evident that a full-voltage starter should be used. In the table this selection is indicated by the fact that for full-voltage starting,

Starting Torque ÷ Full-Voltage Starting Torque = 1

The minimum generator kva. for this trial selection of motor and starter is determined from the table in the same manner as was followed in Example 1, except that in the present example the value of

Minimum Generator Kva. ÷ Motor Horsepower Rating

for K = 7.3 must be obtained by direct interpolation between the values in the columns headed K = 6 and K = 8. Thus, in the present case,

Minimum Generator Kva. ÷ Motor Horsepower Rating = 7.3. Hence,

Minimum Generator Kva. = 7.3 × 100 = 730

Since this minimum kva. exceeds that which was stated to be available, 625 kva., a second trial selection will be made, this time considering a type of motor having a lower starting current.

For the second trial selection assume a normal-starting-torque, low-starting-current motor of the given rating. For this motor published data reveal that:

Full-voltage starting torque = 150 percent of full-load, full-speed torque and,

$$K = 6$$

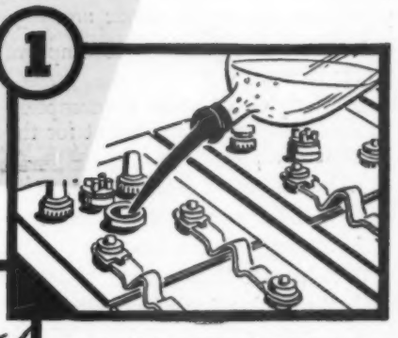
By proceeding in the same manner as was followed in checking the foregoing trial selection (except that since K = 6.0 no interpolation is necessary), it will be found that as previously a full-voltage starter is needed to assure adequate starting torque. The minimum generator capacity, however, is found to be only 600 kva.

Therefore the use of this type of motor will satisfy starting torque and generator kva. requirements.

SAVE TO WIN

EVERY storage battery is a war weapon, containing metals vital to our fighting men. You hold these metals in a sacred trust. It's your duty to squeeze from them every ounce of use . . . by following simple rules for battery conservation.

HERE'S HOW TO MAKE YOUR BATTERIES LAST!*



Keep adding approved water at regular intervals. Most kinds of local water are safe in an Exide Battery. Ask us if yours is safe.

Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner-workings.

Keep the battery fully charged—but avoid excessive overcharge. There's always a right-way to do any job, and a storage battery will last longer when charged at its proper voltage.

Keep records of water additions, voltage and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings. Know what's happening!

Exide IRONCLAD BATTERIES

*** If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.**

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Here's How to Save Power

A 10 percent saving in energy will add two Boulder Dams to our power supply

ENOUGH COAL AND OIL to fill a freight train reaching from New York to Chicago—that is the estimated amount of fuel that would be conserved if 10 percent of the power used in our industrial plants were saved. That amount of fuel would produce approximately 17,000,000,000 horsepower-hours, equivalent to the output of two Boulder Dams.

It is in the conviction that the average plant can save 10 percent of its power that the L. H. Gilmer Company, Philadelphia, has launched its National Power-Recovery Plan.

Seven Ways to Save

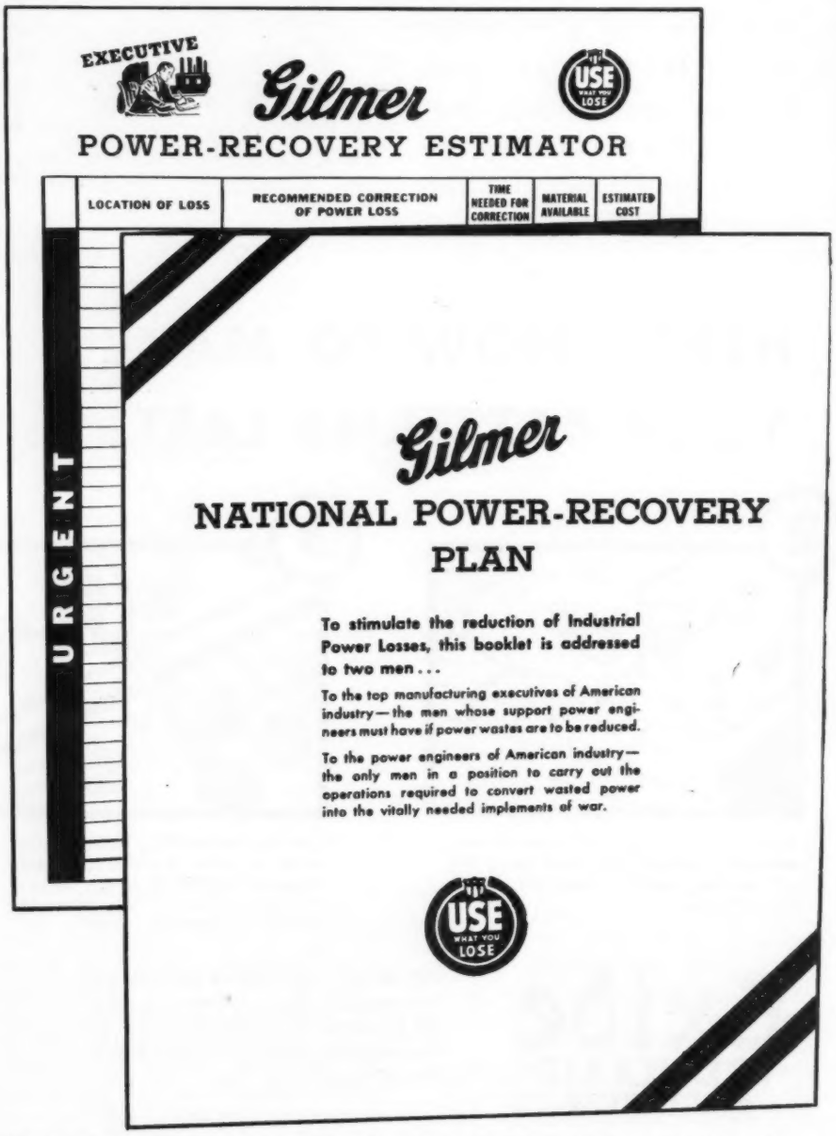
This plan is designed to stimulate the reduction of power losses in industrial plants through better engineering, minor betterments, and organized, systematic maintenance. Among the examples of ways in which power savings can be made are:

1. Use of capacitors to improve power factor.
2. Metering of water consumption and charging each department for the amount used.
3. Insulation of steam pipes.
4. Maintenance of steam traps.
5. Correct belt tension.
6. Adequate lubrication.
7. Proper loading of motors.

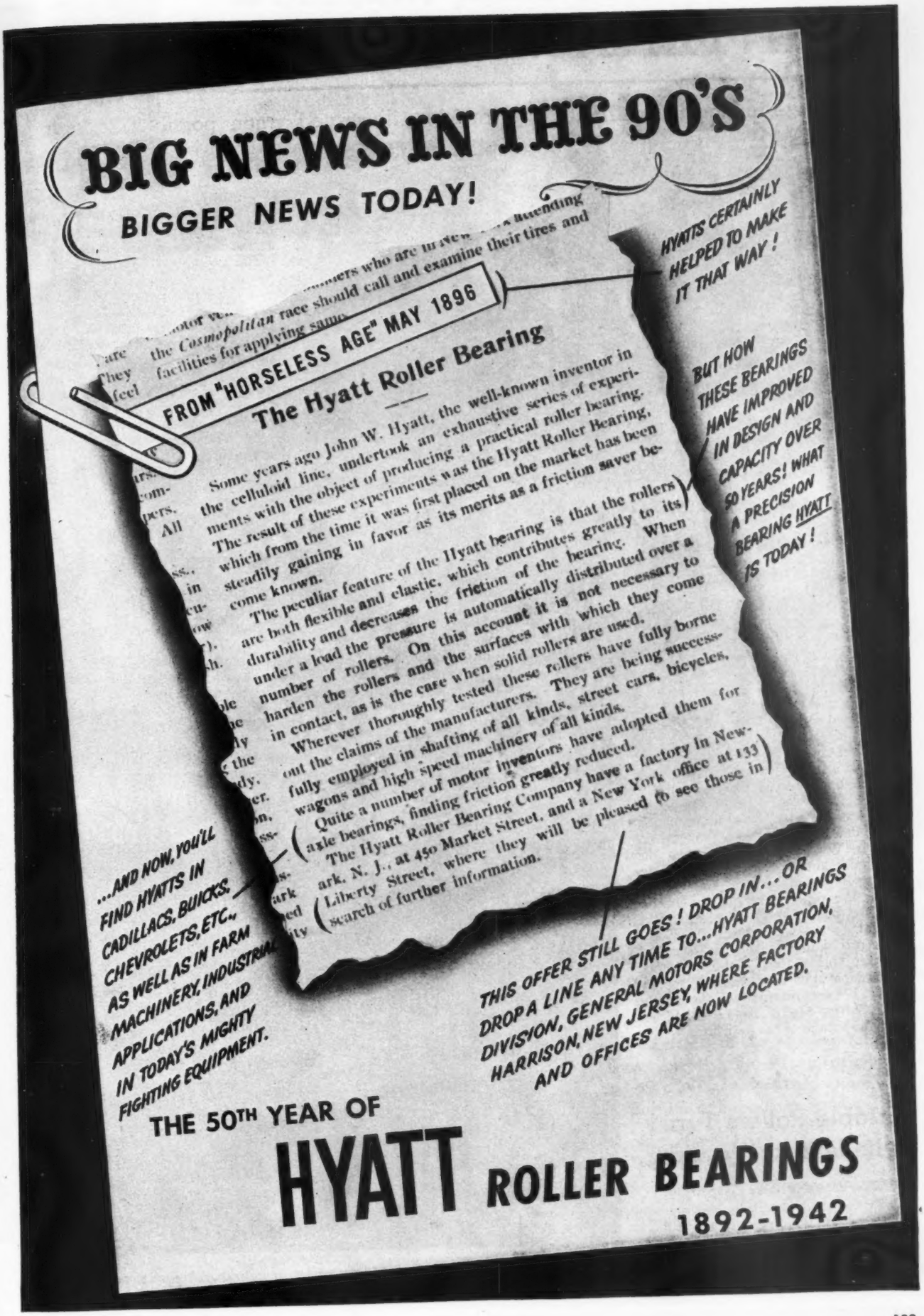
A series of charts termed Power-Recovery Estimators are an integral and unique feature of the plan. Each chart or estimator covers a specific service, such as electricity, mechanical power, steam, hot and cold water, compressed air, refrigeration. These estimators provide a simple, practical form for plant engineers and others responsible for power services to follow in listing: (1) Location of power losses that can most easily be converted into use; (2) action necessary to correct the conditions causing loss; (3) estimate of time needed to make correction; (4) availability of material needed; (5) approximate cost of correction.

The estimators are divided into three sections distinguished by different colors, to provide a simple means of indicating the relative importance of the power losses. Thus the background for urgent items is *red;* for important items, *white;* and for those that are less important, *blue.* On the back of each estimator there are detailed instructions for using it, together with a number of suggested ways in which power savings can be made in the specific service covered by it. After the different estimators have been filled out, it is assumed that the recommendations for power-saving betterments will be discussed and selection made of those that are to be put into effect. These recommendations will then be entered on an estimator marked Executive, for execution or approval by the proper authorities.

Power engineers agree that the estimated 10 percent saving is decidedly on the conservative side; it can be made without entailing major improvements or plant shutdowns, and without the use of critical materials.

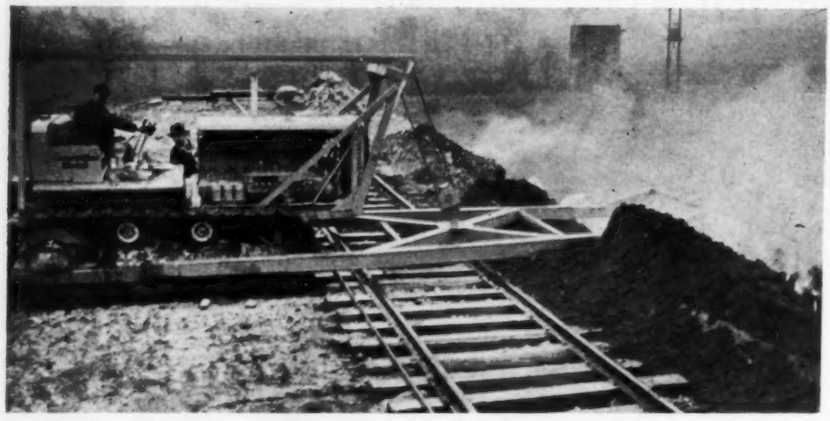

EXECUTIVE
Gilmer
USE WHAT YOU LOSE
POWER-RECOVERY ESTIMATOR
LOCATION OF LOSS
RECOMMENDED CORRECTION OF POWER LOSS
TIME NEEDED FOR CORRECTION
MATERIAL AVAILABLE
ESTIMATED COST
URGENT
Gilmer
NATIONAL POWER-RECOVERY PLAN
To stimulate the reduction of Industrial Power Losses, this booklet is addressed to two men . . .
To the top manufacturing executives of American industry — the men whose support power engineers must have if power wastes are to be reduced.
To the power engineers of American industry — the only men in a position to carry out the operations required to convert wasted power into the vitally needed implements of war.
USE WHAT YOU LOSE

Nine services are covered by the power-recovery plan. On the sheet shown recommendations are listed for action or executive approval


BIG NEWS IN THE 90'S
BIGGER NEWS TODAY!
FROM "HORSELESS AGE" MAY 1896
The Hyatt Roller Bearing
Some years ago John W. Hyatt, the well-known inventor in the celluloid line, undertook an exhaustive series of experiments with the object of producing a practical roller bearing. The result of these experiments was the Hyatt Roller Bearing, which from the time it was first placed on the market has been steadily gaining in favor as its merits as a friction saver become known.
The peculiar feature of the Hyatt bearing is that the rollers are both flexible and elastic, which contributes greatly to its durability and decreases the friction of the bearing. When under a load the pressure is automatically distributed over a number of rollers. On this account it is not necessary to harden the rollers and the surfaces with which they come in contact, as is the case when solid rollers are used.
Wherever thoroughly tested these rollers have fully borne out the claims of the manufacturers. They are being successfully employed in shafting of all kinds, street cars, bicycles, wagons and high speed machinery of all kinds.
Quite a number of motor inventors have adopted them for axle bearings, finding friction greatly reduced.
The Hyatt Roller Bearing Company have a factory in Newark, N. J., at 450 Market Street, and a New York office at 133 Liberty Street, where they will be pleased to see those in search of further information.
HYATTS CERTAINLY HELPED TO MAKE IT THAT WAY!
BUT HOW THESE BEARINGS HAVE IMPROVED IN DESIGN AND CAPACITY OVER 50 YEARS! WHAT A PRECISION BEARING HYATT IS TODAY!
...AND NOW, YOU'LL FIND HYATTS IN CADILLACS, BUICKS, CHEVROLETS, ETC., AS WELL AS IN FARM MACHINERY, INDUSTRIAL APPLICATIONS, AND IN TODAY'S MIGHTY FIGHTING EQUIPMENT.
THIS OFFER STILL GOES! DROP IN... OR DROP A LINE ANY TIME TO...HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION, HARRISON, NEW JERSEY, WHERE FACTORY AND OFFICES ARE NOW LOCATED.
THE 50TH YEAR OF
HYATT ROLLER BEARINGS
1892-1942

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for



Hot slag pushed into pit by tractor fitted with bulldozer and special tool

Tractor Helps Dispose Slag in Steel Mill

SOURCE—Caterpillar Tractor Company, Peoria, Ill.

Disposal of slag and refuse from the steel plant of The Timken Roller Bearing Company, Canton, Ohio, presented a problem which was solved by putting a 95-hp. tractor equipped with a bulldozer and a special tool on the job.

When the slag from the mill is dumped along the edge of the pit from railroad cars, the tractor drops the blade of the special bulldozer over the track right at the edge of the ties. The blade is allowed to sink down until the push-arms rest on the rails. With the rails supporting the blade and holding it to the grade line, the hot slag is pushed over the edge of the pit. As the pit is filled in, the tractor shifts the railroad track over on to the fresh fill.

The special tool consists of a standard bulldozer blade for 35-hp. tractors, mounted on arms that extend it approximately 17½ feet in front of the tractor idler. Cutting edge of blade is 13½ inches below the bottom of the push arms.

•

Portable Rollers Turn Cylinders for Welding

SOURCE—Hobart Brothers Company, Troy, Ohio

During fabrication, heat exchanger shells and other cylindrical bodies must be slowly revolved while the circumferential seams are welded. As demands for more production increased in the welding department at the Johnson & Jennings Company, Cleveland, serious limitations in floor space and the burden on the cranes had to be relieved.

It became evident that portable power-driven rolls were needed, rolls that could be placed in position quickly when and where wanted by the welding operators. Such portable units would eliminate any need for cranes for transferring shells from their original set-up position.

The base for the unit shown in the illustration was built from welded channels and is supported by three cast-iron wheels mounted on roller bearings for portability. A guiding wheel in front was mounted on a cam controlled by the pulling handle. This cam allows the base to rest on the floor when the drive is not in use. The two rolls revolving the shells were mounted on a welded-steel platform. They may be raised or lowered by a hydraulic cylinder through telescoping levers attached to the base and platform.

The drive mechanism consists of a 1-hp. reversible motor connected to a differential gear-reducer unit, which drives a variable-speed unit connected by a roller chain to the shafts on which the rollers are mounted. The welding operator controls movement of the shell through a push-button switch.

This mechanical drive cost $675, took four weeks to build.

This portable unit speeds up welding of large cylindrical shells, saves floor space, reduces burden on the cranes. It's driven by a 1-hp. motor

•

Measuring Wear in a Bearing

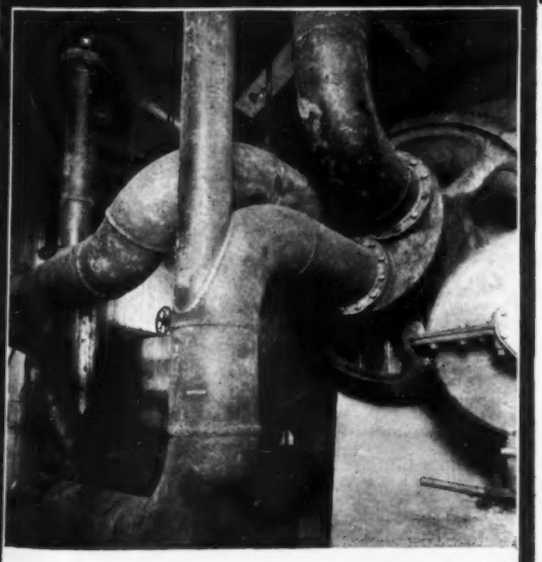
PETER L. BUDWITZ, Meriden, Conn.

In machine maintenance it is often necessary to remove the play from worn cast iron or bronze bearings of the type shown in the sketch, by machining some metal off the bearing cap.

An easy way to determine the exact amount to take off is to remove the cap and place one or two short pieces of soft solder over the shaft, replace the bearing cap over the solder, and tighten it down

Constant jams at the turns upset piping systems, too!

WELD WITH TUBE-TURN FITTINGS TO SOLVE TOUGH PIPING PROBLEMS



In this process industrial plant, the double problem of complete protection against leakage and other possible piping failures plus the necessity of a compact piping layout, is easily solved with Tube-Turn welding fittings. Tube-Turn fittings offer the advantages of greater strength and safety, faster installation, less weight, less pressure loss, less space occupied, and a full line of fittings for every welding piping need.

Tube-Turn Welding Fittings protect your piping where it counts most!

At a roller derby, people rush to get seats near the turns for the thrills are there! It's at the turns where the speeding skaters bunch up and try to cut off opponents—it's here where crowding the turns means trouble. The same hazard exists in piping systems at the turns, for pressure and strain are proportionately increased wherever flow direction is changed. That's why welding with Tube-Turn fittings is the best possible protection against piping failures occurring where the danger is greatest—*at the turns.* There is a Tube-Turn welding fitting for *every* piping turn!

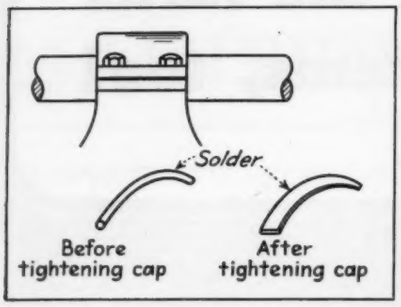
Write for helpful Tube-Turn data book and catalog.

TUBE TURNS, INC., LOUISVILLE, KY. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Tulsa, Houston, Los Angeles, Washington, D. C. *Distributors in all principal cities.*

TUBE-TURN TRADE MARK

The FIRST WELDING FITTINGS 1ST AND STILL THE BEST

Welding Fittings



with the screws, tapping the cap lightly with a hammer during the setting down process. The pieces of solder will flatten to conform to the contours of the bearing. The thickness of the flattened pieces will indicate the amount to be removed from the bearing cap.

•

Where hose couplings are tight-fitting, never drive the coupling in with a mallet or hammer, use grease, or ream out the hose to accommodate the coupling. The coupling should be placed in a vise and the hose forced straight over the sleeve. Either soap or rubber cement can be used safely as a lubricant.

•

Maintenance Schedule Cuts Accidents, Delays

M. ELLSWORTH STONE, Port Blakely, Washington

To minimize accidents and machine failures, Potlatch Forests, Inc., Lewiston, Idaho, set up a dated maintenance schedule for each important part of every piece of machinery and equipment. When a part becomes due for maintenance, the clerk sends a notification slip to the millwright or electrician responsible for its upkeep. The slip is returned by a given date, showing the results of the inspection and the necessary repairs completed.

Should a slip come back showing that an inspection of a machine or part was made, and its condition found to be okay only to have a failure occur within a short time, a glance at the slip will reveal the responsible person.

Inspection and oiling of motors used throughout the plant are included in the dated maintenance schedule.

An original, which goes to the files, and three copies are made of each notification slip. These copies are dispatched to the mechanic, the foreman, and the superintendent, respectively. For routine maintenance, the slips are mimeographed or multigraphed and kept in stock. For less frequent maintenance jobs the data slips are typewritten, with the requisite number of carbons.

Operators at The Visking Corporation, Chicago, use two hands to operate controls on machines where there might be a chance of getting a finger crushed

•

RGB 15015 10-40 5M

MAINTENANCE SCHEDULE MEMORANDUM
FOREMAN'S COPY

For the attention of J. W. Campbell
Every Thursday
Concerning Yard Truck Bars
Memo:

Please have any bent or broken bars at the: (a) West end of main alley in Yard, (b) North end of Tail Race bridge, (c) Northwest corner of Unstacker building for the cleanup truck to pick up today.

Date Issued ..... Time Limit 2 Days
Inspection Made ..... Work Completed .....

This copy is to be kept in your file until the corresponding instruction sheet has been returned to you properly filled in.

Now Is No Time to Nurse Motors!

Don't ask your men to go easy on starting, stopping, or reversing motors.

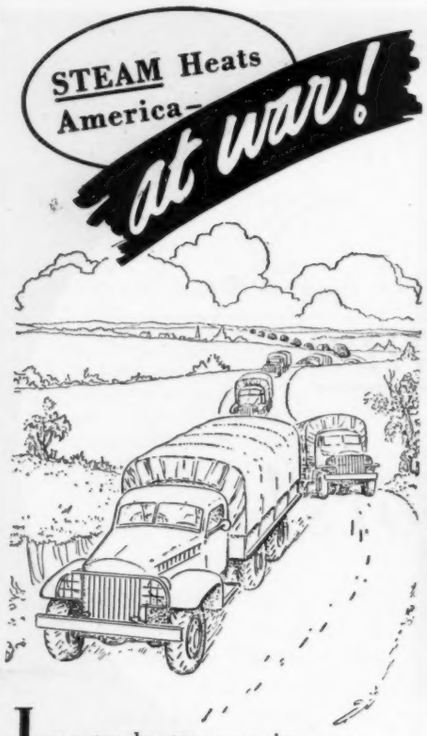
Use your priority to get the motor that's "built to take it" . . . the *only* motor with rotor windings centrifugally cast of COPPER . . . the Fairbanks-Morse Motor. It will speed production now and serve you better in years to come.

Ask for a demonstration . . . a chance to compare F-M and any other motor construction, point by point. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.

Copperspun

FAIRBANKS-MORSE

MOTORS
DIESELS
SCALES
PUMPS



Jeeps, trucks, troop carriers . . .

Half tracks, mobile machine shops . . .

Transportation and supply for an Army of three, six, ten million men . . .

That is America's promise to the Victory Program—and America is going to beat that promise.

It calls for miles and miles of added production space.

New buildings to be heated—evenly, economically. New plants—requiring the finest heating America can provide.

For fifty years, America's best heated buildings have used steam as a heating medium . . . steam harnessed and brought under control with Webster Systems of Steam Heating.

Today, the experience of the Webster Organization in the heating of 75,000 buildings is offered to Army, Navy, Marine Corps . . . and to architects, engineers, and heating contractors working on war construction.

While Ordnance production has first call on our facilities, we are still producing Webster Steam Heating Equipment for use in the war effort.

Essential repairs for Webster Systems are available on A-10 priority, under W.P.B. Emergency Repair Order P-84. Orders should be limited to actual needs.

Warren Webster & Company, Camden, N. J.
Representatives in 65 principal Cities

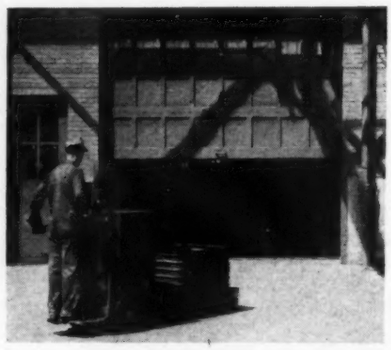
Webster
Steam Heating

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• TWO BOOKLETS, "Signposts of Industrial Relations" and "Working With Unions, Grievance Procedures," have been made available by American Management Association, 330 West 42nd St., New York, 50c each.



RADIO DOOR-CONTROL designed to open and shut garage doors for motorists finds application as a wartime anti-sabotage device. Doors operate automatically upon approach of trucks equipped with the device. Thus, the right persons may enter, the wrong must stay out. Barber Colman Co., Rockford, Ill.

• HEALTH-EDUCATION FILMS. Introductory film, "Take Care of Yourself," and three of a series of films dealing with industrial health, "The Cold Bug," "Food Keeps You Fit," and "Stay on the Beam" (morale) have been released. Subsequent films will cover sleep, nervous fatigue, indigestion, cleanliness, recreation and exercise, hygiene. Commercial Films, Inc., 1800 East 30th St., Cleveland.

• "THE COMING CRISIS in Manpower," points out that we shall need 13,000,000 war workers in the next year; that our armed forces will take 2,000,000. Discussion outlines available sources of manpower and suggests how the demand can be met. 10c. Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York.

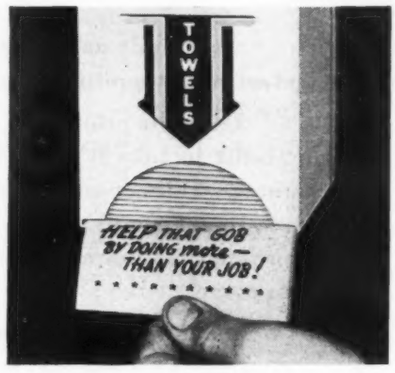
• SPONGE made of small pieces of chamois sewed in a cluster to hold water does two jobs. Soak it well and it serves as a sponge, wring it out and you have a chamois. Tamms Silica Co., 228 North LaSalle St., Chicago.

• COMPREHENSIVE STUDY of the problem of industrial fatigue, its effect on production, and methods for control, is based on the author's practical experience in industrial medicine, and the reports and conclusions of industrial experts. Bibliography of informative literature is included. Zurich General Accident & Liability Insurance Co., Ltd., 135 South LaSalle St., Chicago.

• MAGNESIUM FIRES and bombs are quickly snuffed out when covered with a powder said to eliminate danger of explosion, and to reduce the heat given off. It is also claimed that a few pounds of the powder can put out 100 pounds of burning magnesium. The C. P. Hall Co., 2510 First Central Tower Bldg., Akron.

• IMPORTANCE of the proper diet and its effect upon health, stamina, and morale of workers; the results following change from inadequate to adequate diets are discussed in "The Food and Nutrition of Industrial Workers in Wartime." Food and Nutrition Board, National Research Council, 2101 Constitution Ave., Washington, D. C.

• REPRESENTATIVE STOCK of the NE "lean" alloy steels established by the metallurgical staff of WPB to help conserve nickel, chromium, vanadium, etc., for the duration is available in hot-rolled rounds in sizes ranging from ½ to 7 inches diameter, and in six different analyses. Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago, is prepared to supply them in small lots for treating and testing in specific applications.



TIME WAS when talking pictures were a novelty, but now it's "talking towels." They bear a variety of messages that would add to the punch of any morale-building program. Precision Paper Tube Co., 2043 West Charleston St., Chicago

• IN OUR JUNE ISSUE reference was made to the statements of two companies relative to labor disputes over union security. Now a third statement, submitted to the National War Labor Board by the Youngstown Sheet & Tube Co., Youngs-

Billets to Bars in Fewer Passes

SUNOCO *Doubles Reduction...Speeds Production*

Gives Dies Three Times Longer Life

Bars . . . bars . . . and more bars for bullets, small shells and other vital war needs — that's the demand of our armament industry today. And when a change in one operation steps up production all along the line . . . that's news on the home front that really counts on the fighting front.

Production of bar stock in one large plant was seriously hampered because of short die life and rust in storage — dies had to be replaced too frequently, rust necessitated an extra operation. But these problems soon were eliminated when, on the recommendation of a Sun Oil Engineer, they changed to a Sunoco drawing oil.

- **Production increased with double amount of reduction per pass**
- **Die life tripled**
- **Reprocessing no longer necessary**
- **Rust in storage was eliminated**
- **Bar deliveries speeded-up**

Here's another example of how the services of Sun Oil Engineers — those Doctors of Industry — are helping industry help America. They always stand ready . . . willing . . . and able to help you in your plant. The services and products they offer are yours to use to improve production . . . and for factual proof that you can use, write for your copy of "Helping Industry Help America."

SUN OIL COMPANY • Philadelphia

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUNOCO

SUN PETROLEUM PRODUCTS.. HELPING INDUSTRY HELP AMERICA

War Boat Builders SPEED Production WITH VAN DORN

CONVERTING to naval cargo-ship funnels from store fixture manufacture, one war producer tested various portable electric tools. *He chose Van Dorn as the most efficient.* The same experience was duplicated by a manufacturer of wooden marine craft.

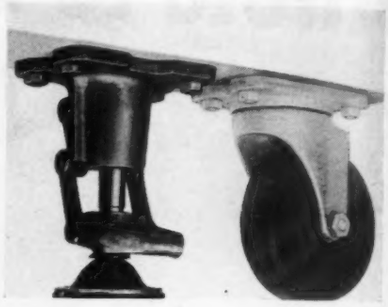
Van Dorn's unusually complete line of drills, sanders, grinders, nut runners—tools for every kind of production and assembly job—give you the right tool for your special spot. They're powered for non-stop production lines. And they're backed by Van Dorn's 26 Factory-owned Service Branches—largest in the industry. Call your Van Dorn jobber, or write The Van Dorn Electric Tool Co., 719 Joppa Road, Towson, Maryland.

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

town, Ohio, has come to our attention. It outlines the company's reasons for opposing union demands for increase in pay, union shop, and check-off.



WHEN IT'S DOWN, this floor-truck lock applies approximately 12 sq. in. of friction locking surface to the floor to hold the caster truck, dolly, or other conveyance right where you stopped it. Gentle foot pressure on the lever raises and lowers the brake shoe. The Bassick Co., Bridgeport, Conn.

• BECAUSE FLYING GLASS wreaks havoc on delicate machinery, a laminated plastic glass with a reinforcement filler of wire screen mesh has been developed. Said to be shatterproof, crystal clear, and to permit passage of ultra-violet rays. Celanese Celluloid Corp., 180 Madison Ave., New York.

• TAMPERPROOF HOUSING for fire extinguishers consists of an all-metal box with side windows for inspection and a padlock to prevent meddling. Hand pressure on breaker arm breaks the lock seal and door springs open revealing the extinguisher as you put it in, ready for use. Erie Supply & Equipment Co., 426 Huron Ave., Sandusky, Ohio.

• LUMINESCENT blackout signs activated by sunlight, electric, gas, or fluorescent light glow in the dark for as long as 8 hours to point out exits, fire escapes, stairways, elevators. They recharge whenever exposed to light. Cardy-Lundmark Co., 1801 Byron St., Chicago.

• WAR DEPARTMENT specifications for standard blackout equipment for buildings. Bulletin is intended for the use of Army and governmental officials and equipment manufacturers, where necessary, for the establishment of effective measures for adequate blackouts through the use of approved technical devices and materials. War Department, Bureau of Public Relations, Press Branch, Washington, D. C.

• IF YOU'RE LOOKING for something to hold bundles of papers, folders, cards, together, in place of rubber bands, you'll be interested in Ty-Tyte. It is a small piece of tough paper with a paper button attached—you've seen them on string envelopes—and a 26-in. cord attached to that. Horder's Inc., Jefferson and Quincy Sts., Chicago.

SKILSAW TOOLS

HELP WAR-BUSY HANDS GET MORE DONE *faster!*

● America wants more speed in production . . . and *fast* SKILSAW TOOLS give every hand more productive power. America wants fewer work interruptions . . . and *dependable* SKILSAW TOOLS keep every hand on the job. It's no accident that SKILSAW TOOLS are at the front in the battle of production—America's busiest war-work plants use them to cut days from schedules, to pack more vital work into every hour that brings us closer to Victory!

If you have problems of production speed (and who hasn't?) ask your distributor to show you, in your own plant, on your own work, how SKILSAW TOOLS can help you.

SKILSAW, INC.
5043 Elston Avenue, Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Seattle • Toronto, Canada

ABOUT DELIVERIES

Your distributor can deliver most SKILSAW TOOLS from stock or ship promptly from factory . . . for all war-production needs

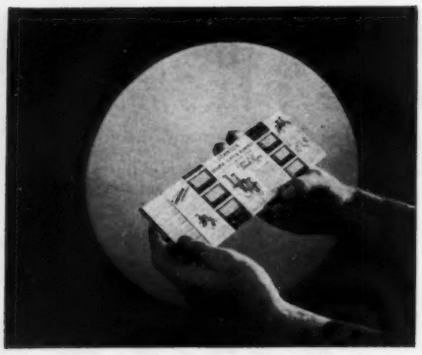
• SKILSAW DRILLS—23 Models. For fastest production drilling. Capacities from ¼ in. to ⅞ in. in steel.

• SKILSAW DISC SANDERS—9 Models. Grind, file, sand and polish on all flat or curved surfaces.

• SKILSAWS—9 Models. Cut metals, wood and compositions in production and war plant construction.

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★



SLEEVE BEARING SLIDE RULE

● Here is an ingenious device that will enable you to tell at a glance if the sleeve bearings you require are standard stock items. You simply select the shaft size . . . then move the slide section to either right or left . . . and the correct combination of inside diameter, outside diameter, length and part number will appear.

This slide rule covers a range of over 800 stock size bearings. Every item listed thereon is available . . . in any quantity . . . immediately from stock. Every bearing is cast in S.A.E. 64 . . . the best general purpose bearing bronze available.

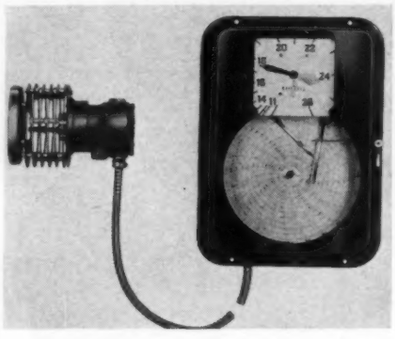
Why not write for one of these handy rules today? Your request carries no obligation. We will be glad to forward the rule, together with our new catalogue, and the location of your nearest source of supply.

JOHNSON BRONZE
512 SOUTH MILL STREET
NEW CASTLE, PA.

WHAT'S NEW IN EQUIPMENT

Radiation Pyrometer

Radiation pyrometer, known as the Pyrovac, is designed for recording, indicating, or automatically controlling temperatures in furnaces and kilns above 900 degrees Fahrenheit. The temperature-sensitive unit or radiation head is mounted on the outside of the furnace, out of the hot zone, where it picks up heat rays emitted from the object under measurement, thus registering its surface temperature. In-

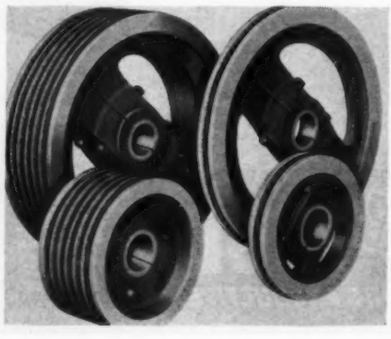


tended for use in measuring and automatically controlling temperatures that fall into these classifications: (1) High temperatures out of the range of the thermocouple; (2) temperatures for which rare-metal thermocouples are used; (3) surface temperatures, such as roof, wall, duct, lining, or retort temperatures, and the temperature of the work itself rather than furnace or kiln temperature surrounding the work; (4) where object is moving, is inaccessible, or there are space limitations. The Bristol Co., Waterbury, Conn.

Wood Sheaves

Victory wood sheave for V-belt drives is now being offered as an alternate for metal sheaves. The efficiency of this sheave is claimed to be equal to that of metal sheaves except where fly-wheel effect is essential. It is of laminated construction and the segments are of selected straight-grain kiln-dried hard maple. Wood bushings are provided and provision is made for firm fastening to shaft.

Offered in composite groove types for



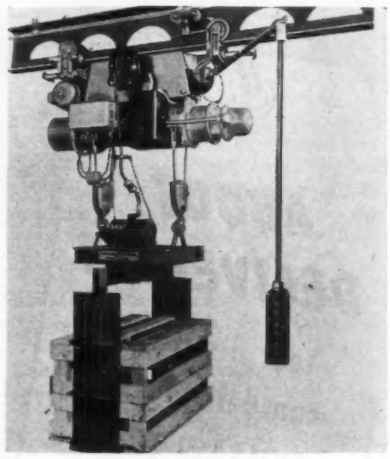
A and B section belts in a full range of sizes and for B belts in sizes from 5.4 to 38.0 pitch diameter up to 10 grooves, and for C belts from 5.4 to 44.0 pitch diameter up to 12 grooves. Dodge Manufacturing Corp., Mishawaka, Ind.

Crate Grab and Carrier

Motor-driven crate grab and carrier, especially designed for handling crates and boxes in and out of storage, or from one elevation to another, enable the quick stacking or removal of crates at a great height with safety, it is claimed.

The grab and carrier are completely motorized with all operations conveniently controlled by the six buttons of the push-button station. Can also be provided with an operator's cab in which all controls may be located. Arms of grab are extended and retracted by geared slide bars that are driven by the motor mounted on top of the grab. Power is supplied through a flexible cable that is held taut by a spring-type retrieving reel.

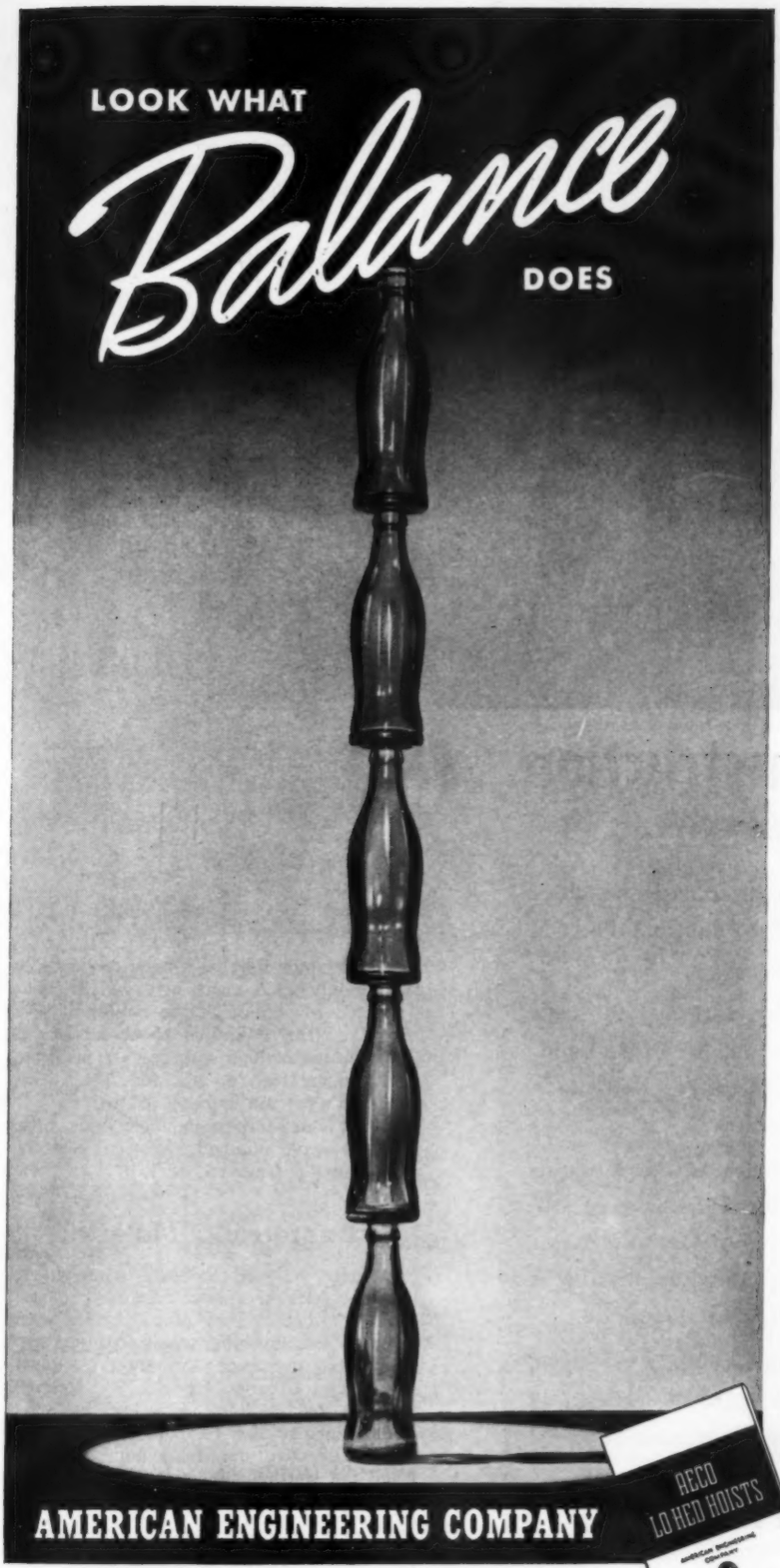
Double-hook cable type electric hoist elevates and lowers the grab with little swing, making it easy to spot it as desired. A quick acting electric brake stops

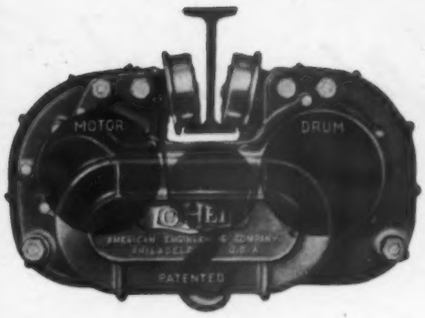


and holds the load wherever desired. Will lift loads up to 1500 pounds a distance of 20 feet. Arms may be spread to 36 inches, retracted to 18 inches. Similar units can be built for heavier loads and to suit other dimensions. Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Furnace Door

Furnace access, inspection, and clean-out door for boilers, incinerators, features Lock-Tite handle, which locks the door so tightly that all infiltration of excess air around the door is eliminated. Handle operates on a cam and lever principle so that the further the handle is depressed,





Look what BALANCE does in an electric hoist

Looking for an electric hoist that will give you years of satisfactory service after the war? Then take a look at the balanced construction of the Lo-Hed hoist—motor and drum arranged on opposite sides of the beam.

This unique construction gives you minimum headroom—a desirable plus feature for which you pay no premium. Balanced construction means much to you in dollars and reliability.

Because of balanced construction, the Lo-Hed hoist can use an efficient all-spur gear drive (sealed in oil), husky, short shafts for greater torsional strength, easily removable covers.

Along with these Lo-Hed features is everything else you want in an electric hoist—heavy duty hoist motor, ball or roller bearings, automatic holding brake, 100% positive automatic upper limit stop, fire, dust and moisture proof controller, and precision machining. Buy the hoist that will last longer—Lo-Hed. Ask for the complete catalog of Lo-Hed Hoists.

The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

•

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative

•

OTHER A-E-CO PRODUCTS: **TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER**

AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia, Penna.

☐ Please send me your complete catalog of LO-HED HOISTS
☐ Ask your representative to get in touch with me promptly

Name_____

Company_____

Street Address_____

City_____ State_____
(Please Print Plainly)

Ahead of Schedule!

The plate shop at a prominent United Nations' shipyard completed in one month by TECO prefabricated timber construction

TECO Timber Construction

Uncorks a Bottleneck!

Prefabricated timber construction produced this shipyard roof truss job one day ahead of the contract date . . . gained a day in the Battle of Defense!

The giant structure was originally designed for construction in another material, traditional for these buildings, but the shipbuilders found themselves in a bottleneck when they were unable to get deliveries.

Here, the lumber industry demonstrated once again, dramatically, that new engineering formulas have graduated lumber from a simple carpentry material to a major engineering medium capable of meeting the test on a big building project where time is a vital element.

The 170'x400' plate shop in which 80,000 to 90,000 board feet of lumber were used, includes 46 50' and 48 40' trusses; 34 bracing trusses, and 54 bracing frames.

The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play

Write for Literature

Timber ENGINEERING COMPANY

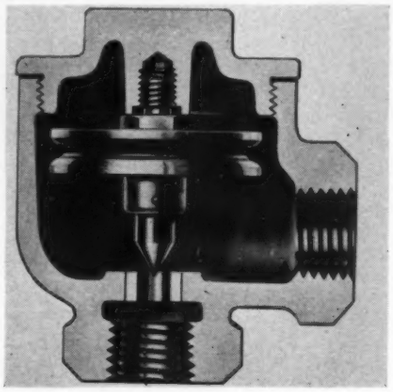
WASHINGTON D. C. PORTLAND, OREGON

the tighter the door is forced against the frame. Door is lined with Plicast L-W-I lightweight insulating refractory material which, it is claimed, reduces the weight of door, protects metal from heat, and decreases radiation of heat into boiler room. Plibrico Jointless Firebrick Co., 1800 Kingsbury St., Chicago.

Traps and Valves

Old Ironsides line of radiator traps and valves features cast-iron bodies and bonnets in natural finish for painting after installation. Nickel and other platings are eliminated. Brass formerly used in trap and valve bodies, caps, nuts, and nipples is conserved. Machines that ordinarily make nuts and nipples are released for direct war production.

Traps and valves are designed for connection to the radiator with a right- and



left-hand pipe nipple—a practice that was commonly used years ago and is now resorted to because of the important savings resulting. Limited to three sizes—½ inch for 2000 square feet; ¾ inch for 400 square feet; ¾ inch for 700 square feet. Valves are limited to two sizes—¾ and 1 inch, both in angle body with wheel handle standard. Warren Webster & Company, Camden, N. J.

Degreasing Material

Specially designed to meet demand for faster cycles in anodic degreasing or reverse current cleaning of cold rolled steel parts before finishing, an alkaline-type material has just been announced. Known as Oakite Composition No. 90, material is reported to have high conductivity, ready adaptability to hard water conditions, effective smut-removing properties, and fast wetting-out action. Oakite Products, Inc., 14A Thames St., New York.

Tool Grinders

Wheel guards on Models 10 and 14 inch carbide tool grinders, known as No-Spray-No-Splash, and coolant flow control, keep the operator and floor dry during wet grinding operation, it is said. Guards are concealed and are close to the wheels. Each guard is easily rotated from one side of the wheel to the other by a handle.

As an integral unit, the hood which incloses the No-Spray-No-Splash guards

HELP NEEDED

Women Workers
Untrained Workers
Experienced Workers

All need the help of "THREE DIMENSIONAL SEEING"

"SLOW DOWN!" . . . *says this camouflage*

• The dark and dingy machine blends in with material worked. It's a complete camouflage. The worker can't see clearly what he's doing. A "slow-down" results. More lighting is not always the solution. The machine just soaks up light. Eyestrain, mistakes, accidents and low morale are the penalties.

THIS NEW DU PONT COLOR SYSTEM is helping industry win the war. In our battle of *production* as well as *at the front* we must grasp every opportunity. "Three Dimensional Seeing" is helping industry everywhere to "keep 'em rolling"—faster! It speeds production output; it conserves manpower by reducing accidents; it conserves materials by reducing rejects.

This new system came from scientific research! Du Pont paint technicians worked with illuminating engineers over two years. They tested many color combinations . . . on many machines, in different shops, under varying lighting conditions.

One result is a color system (pictured) ideal for most machine operations. It consists of *DULUX Spotlight Buff* for the work surfaces and *DULUX Horizon Gray* for other surfaces.

Scientifically controlled tests show that in many cases this color scheme is helping to raise production . . . with less fatigue, fewer accidents and improved morale among workers. This research also provides new color systems for special machine operations. We invite you to consult with us on your particular problems.

"SPEED UP!" . . . *says Three Dimensional Seeing*

• Correct color provides contrast that makes the work stand out sharp and clear. Danger areas are well defined. The worker has more light for *seeing* now that the machine is a *light reflector* instead of a *light robber*. This speeds up production and improves quality. It cuts down accidents, too.

WHAT FREE BOOKLET GIVES YOU—

24 pages with photographs in color. Results of time tests and psychological studies. Actual paint chips of best colors. Explains development steps and basic principles of the new system. Clip the coupon now. Send for your free copy.

SEND COUPON TODAY

DU PONT

E. I. du Pont de Nemours & Co. (Inc.)
Finishes Div., Dept. FM-72, Wilmington, Del.

Please see that I get booklet and complete information about *"Three Dimensional Seeing."*

*Name*_____

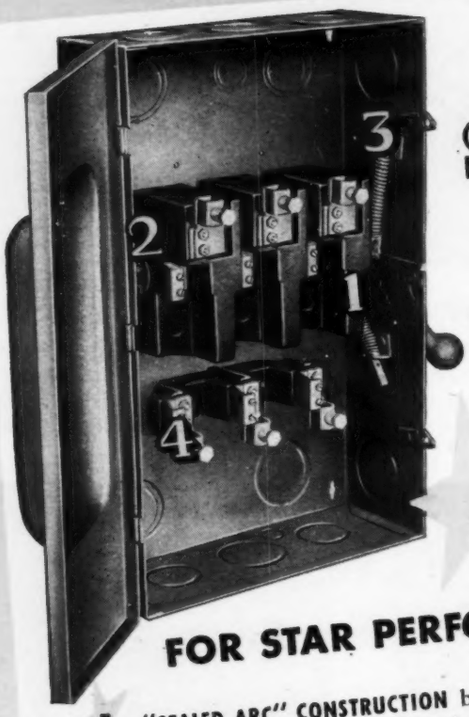
*Firm*_____

*Address*_____

*City*_____ *State*_____

FEDERAL

ELECTRIC PRODUCTS



Sealed Arc

SAFETY SWITCHES FOR INDUSTRY

star features

FOR STAR PERFORMANCE

1 **"SEALED ARC" CONSTRUCTION** barricades switching arms behind porcelain to minimize effects of arcing, assure long life for contacts.

2 **VERTICAL-RIBBED ARCING CHUTES,** lining interior chamber of switching block, break up and snuff the arc. An exclusive Federal feature.

3 **STURDY QUICK-MAKE, QUICK-BREAK** spring mechanism.

4 **PATENTED "VISE-CLAMPS"** grip fuses tighter than old-fashioned spring tension, prevent heating.

These are but four of the many features that make Federal "Sealed Arc" Safety Switches favorites for every industrial application. Use them for trouble-free operation on your essential circuits.

For Complete Safety Switch Data

write for Bulletin 21-40-S. Contains all essential facts on Types A, C and D Federal "Sealed Arc" Safety Switches.

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.

58 PARIS STREET, NEWARK, N. J.

Follow the Federal Line

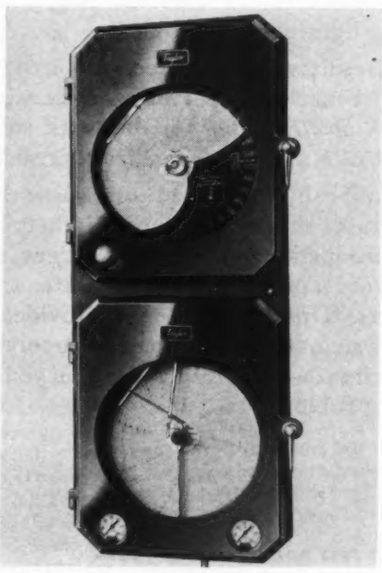
PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

and the table mechanism, protected from ingress of dust and grit, is mounted on inclosed shaftways and is moved in or out from the wheel by a crank. Hood is easily removed by two socket-head capscrews on either side of hood section. Water connections inside hood are of flexible hose, which permits hood section to be laid on top of machine while changes are made. Wheels are then replaced by cranking the table unit to its most forward position.

Model 10 is equipped with 10-in. diameter silicon carbide wheels, Model 14 with 14-in. diameter wheels. Either model is available for wet or dry grinding. Hammond Machinery Builders, Inc., 1637 Douglas Ave., Kalamazoo, Mich.

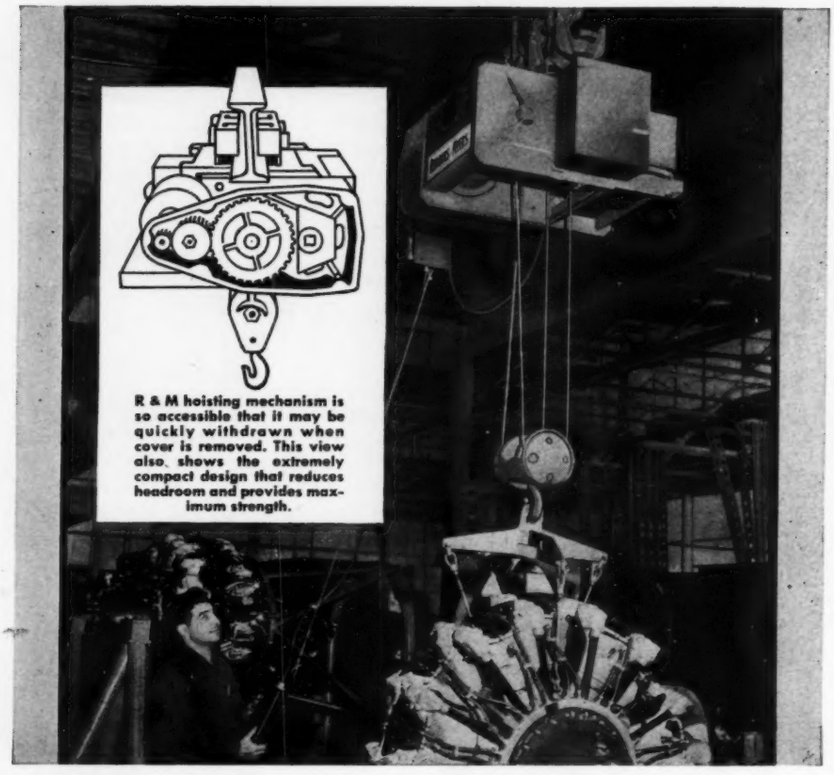
Time Schedule Controller

Maintaining exact temperature, pressure, flow, or liquid level according to a predetermined time schedule is the duty of Taylor Fulscope time schedule controller. Once the processing schedule has been determined, it is possible to repeat the process as many times as desirable, it is claimed. Cam and chart are individually mounted and conveniently located for instant visual comparison. Friction drive cam assembly permits rotation of the cam without loosening locking means. One cam can be reset without disturbing the other, in an instrument with two complete control mechanisms. Each cam is



Better filing with
THE RIGHT FILE FOR THE JOB
• There's a fast and a slow—an efficient and an inefficient—way of doing everything. This is particularly true of filing.
• Nicholson Special Purpose Files are designed to speed filing work —produce better results—reduce rejects and wasted effort.
• "Speed it up!" is the industrial war cry. Take die castings. You can do a fair finishing job with an ordinary file. But you can do it heaps faster and more accurately with *The right file for the job.*
• Nicholson or Black Diamond special files for finishing die castings of aluminum-alloy and similar metals are made with extra-strong teeth on sides, edges and corners—to resist shelling off and breaking out. The design eliminates to a great extent the tendency of these metals to clog the file. Regularly made in Mill Bastard and Half Round Smooth. . . . And *Twelve perfect files in every dozen* are guaranteed! Obtainable through your mill-supply house.
NICHOLSON FILE CO. • PROVIDENCE, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)
• FREE TECHNICAL BULLETINS on Nicholson or Black Diamond Special Purpose Files for: Stainless Steel, Aluminum, Brass, Lead, Foundry Castings, Die Castings, Die Making, Plastics; Sheer Tooth and Lathe filing. Name ones wanted.
LET'S GO U.S.A. KEEP 'EM FLYING!
NICHOLSON FILES
FOR EVERY PURPOSE
NICHOLSON U.S.A.
MADE IN U. S. A.

14 R&M HOISTS Speed this Firm's War Work!


R & M hoisting mechanism is so accessible that it may be quickly withdrawn when cover is removed. This view also shows the extremely compact design that reduces headroom and provides maximum strength.

In the roaring plant of [redacted], now pouring out sleek "[redacted]" fighters in deadly numbers, R & M All-Steel Hoists—*fourteen* of them—are helping *lift* production to new records!

Mounted on an R & M Motor-Driven Trolley, the 3-ton model shown above is "air-expressing" an engine to the next operation. Thirteen other R & M Hoists, strategically spotted in several departments, are similarly speeding [redacted]'s output.

R & M All-Steel Hoists range in capacity from 1,000 to 15,000 lbs. They're precision-built of *steel* from track to hook, handle loads from any angle with perfect balance. For these reasons—and because of their trouble-free, year 'round performance—they are the choice of production men in countless industries.

Whatever *your* hoisting problem, "take it up" with R & M! Our expert representatives will help you find the solution. Call the nearest R & M sales and service office, or write us at the factory.

R & M SALES AND SERVICE OFFICES

Albany.....364 Broadway
Atlanta.....319 Walton Bldg.
Baltimore, Lombard & Concord St.
Boston.....55 Long Wharf
Buffalo.....2005 Delaware Ave.
Chicago....2400 W. Madison St.
Cincinnati.....418 New St.
Cleveland..352 Rockefeller Bldg.
Dallas.....1100 Cadiz St.
Denver.....1420 16th St.
Detroit.....2921 E. Grand Blvd.
Houston..3715 Harrisburg Blvd.
Jacksonville....305 Bisbee Bldg.
Newark.....700 Bergen St.
New York.....200 Varick St.
Philadelphia.....401 N. Broad St.
Pittsburgh.....H. W. Oliver Bldg.
San Francisco, 116 New Mtgmry. St.
Seattle.....216 Walker Bldg.
Syracuse....204 State Tower Bldg.
Montreal....Lyman Tube & Supply Co., Ltd.

ROBBINS & MYERS • Inc.

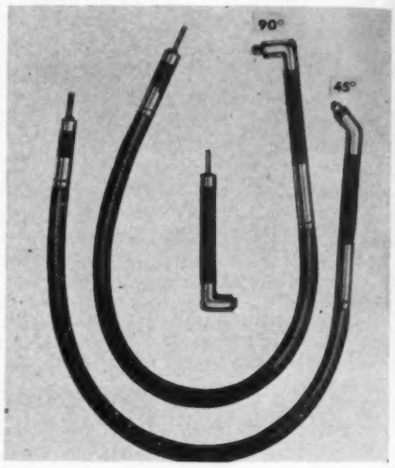
HOIST & CRANE DIVISION • SPRINGFIELD, OHIO

MOTORS • FANS • MOYNO PUMPS • FOUNDED 1878

capable of operating from one to four air valves, microswitches, or both, for the actuation of any external mechanism such as a valve, bell, or light, and do this automatically in any desired relation of one to the other. Cam returns automatically to the starting position. Available in all control forms, including automatic reset and pre-act. Universal case for face or flush mounting. Taylor Instrument Companies, Rochester, N. Y.

Angle Drills

For difficult drilling in hard-to-reach spots, flexible shaft units with 45 and 90 degree angle heads are available. Easily hooked up by fitting end of shaft into electric drill chuck. Built for heavy-duty



service, gear-driven, ball-bearing, and permanently attached to flexible shaft. Spindle threads are threaded for adapters, ¼-28 thread, accommodating either stub or full-length drills up to size No. 30. Clearance distance from drill center to outer surface of angle head housing is ⅜ inch. Stow Manufacturing Co., Inc., Binghamton, N. Y.

Filters

Two-outlet and three-outlet filters, for serving two or three air tool operations at one point, are announced. The CCA (Conditioned Compressed Air) filter prevents dust, rust scale, oil, and water from going into air tools and prolongs life and efficiency of pneumatic equipment, according to the manufacturer. Centrifugal action of the air within the filter removes 90 percent of the dirt and moisture and the balance is filtered out by a wool-felt glove. For cleaning, water and dirt are

Let us help you *speed* war production

ALTHOUGH our stocks of steel are not what we wish they were, what we have can be yours in a hurry—subject, of course, to priority restrictions. If we don't have what you need, we will do everything possible to help you find a source of supply. Our first job, like yours, is to do everything we can to speed production that will help win the war.

"Scully Service" is on the job—in all of our eight conveniently located warehouses—day and night. Be sure to try Scully—see our phone numbers at the left. Cut out the number of the warehouse nearest you and paste it in a handy spot.

Call Scully

CHICAGO
BRUnswick 2000
Teletype CG. 605

BALTIMORE
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BOSTON
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CLEVELAND
HEnderson 5750
Teletype CV. 153

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CEdar 7780
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ST. LOUIS
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Bigelow 3-5920
BErgen 3-1614 - REctor 2-6560

IN STOCK! DARDELET "RIVET-BOLTS"

We can offer immediate shipment of both Dardelet "RIVET-BOLTS" and Dardelet Machine Bolts. These bolts save valuable time and labor and assure permanently tight joints.

The Dardelet "RIVET-BOLT" is a ribbed bolt with Dardelet self-locking thread, and is widely used for field erection of structural steel. Has recessed nut. Bolt is driven in and nut is applied with wrench. Economical and strong.

The Machine Bolt with Dardelet self-locking thread is for general use where vibration is present.

Scully Service

USS

SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel and Steel Products

Warehouses at CHICAGO · NEWARK, N. J. · ST. LOUIS · BOSTON
ST. PAUL - MINNEAPOLIS · CLEVELAND · PITTSBURGH · BALTIMORE

UNITED STATES STEEL

ARTERIES for PRODUCTION'S "LIFEBLOOD"

made to order—fast!

GRINNELL provides the means for converting a *pile* of pipe into a piping *system* . . . a vital artery to furnish Power . . . Fire Protection . . . Heat . . . Fuel . . . Air . . . Water . . . Humidification in a plant, a ship, a tank or a plane.

Taking the OFFENSIVE against delays in production, Grinnell has stepped up its facilities to handle all requirements "whenever piping is involved" – *faster.* Included are pipe prefabrication for power and process lines, automatic sprinkler fire protection, cast and malleable iron fittings, pipe hangers for every condition, welding fittings, heating specialties and humidification systems. Grinnell Co., Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of U. S. and Canada.

Don't let delays occur – call upon GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc. • *Grinnell Company of the Pacific* • *Grinnell Company of Canada, Ltd.*
General Fire Extinguisher Company • *American Moistening Company*
Columbia Malleable Castings Corporation • *The Ontario Malleable Iron Company, Ltd.*

blown out of the drain valve at the bottom of the bowl, and filter may be completely dismantled without disconnecting from the line. Filters, Inc., Glendale, Calif.

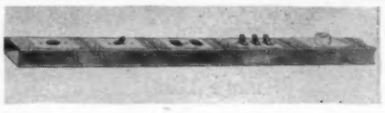
Dial Gages

Diameter and roundness gage, inside diameter gage for shallow holes and recesses,

and gage for inspecting distance between faces of crankshaft bearings have recently been announced. All are claimed to be unusually sensitive and accurate. Federal Products Corp., 1144 Eddy St., Providence, R. I.

Wiring

Newly developed fittings and installation methods make possible simplified network type of electric wiring installation, it is claimed. Rigidity of Wiremold No. 3000 channel and hanger fittings permit spanning of beams. Minimum number of slip



joint fittings cover all installation methods and requirements. Simplified layouts use minimum of steel and other scarce materials, require no pipe-threading equipment, eliminate mess and inconvenience, reduce material waste. Standardized sections and parts can be quickly installed, using only hacksaw, screwdrivers, pliers. Installations for fluorescent lighting of working areas can be completed using same basic Wiremold No. 3000 channel with reflectors, ornamental glass inclosures, hangers, and fittings for both unit type or continuous fluorescent fixtures. The Wiremold Co., Hartford, Conn.

Searchlight

For use at industrial plants, public utilities, ordnance plants, and aboard ships, 18-in. incandescent searchlight with pilot house control or flat base is announced. Intense beam concentration is obtained by a primary precision-ground and polished silvered-glass reflector and a metal secondary reflector to permit continuous operation with lamps up to and including 1500 watts. A tandem reflector shield, mounted in the center of the primary reflector, eliminates all secondary heat concentration on the lamp bulb. Heat dissipation is by radiation, permitting a dust-tight inclosure.

Body and back sections of the housing

Set up this Wartime Board of PRODUCTION CONTROL

War-production machines and processes can be more closely controlled in operation, if they are equipped with Veeder-Root Counting Devices. For these devices supply a continuous record of production in most any terms, pointing out any tendencies to waste and inefficiency as soon as they develop. Even more, they supply facts-in-figures that simplify maintenance and payroll problems, provide working incentives, help safeguard quality and delivery dates. And if your plant is on vital war work, you can still get the Veeder-Root Devices you need . . . *to make your work count to the utmost.*

Top left: 3-shift Pick Counter for textile looms.
Top right: Predetermining Counter controls high speed runs.
Lower left: High Speed Reset Counter for coil winders, fast automatics, etc.
Lower right: Remote-indicating Magnetic Counter flashes production records from plant to office.

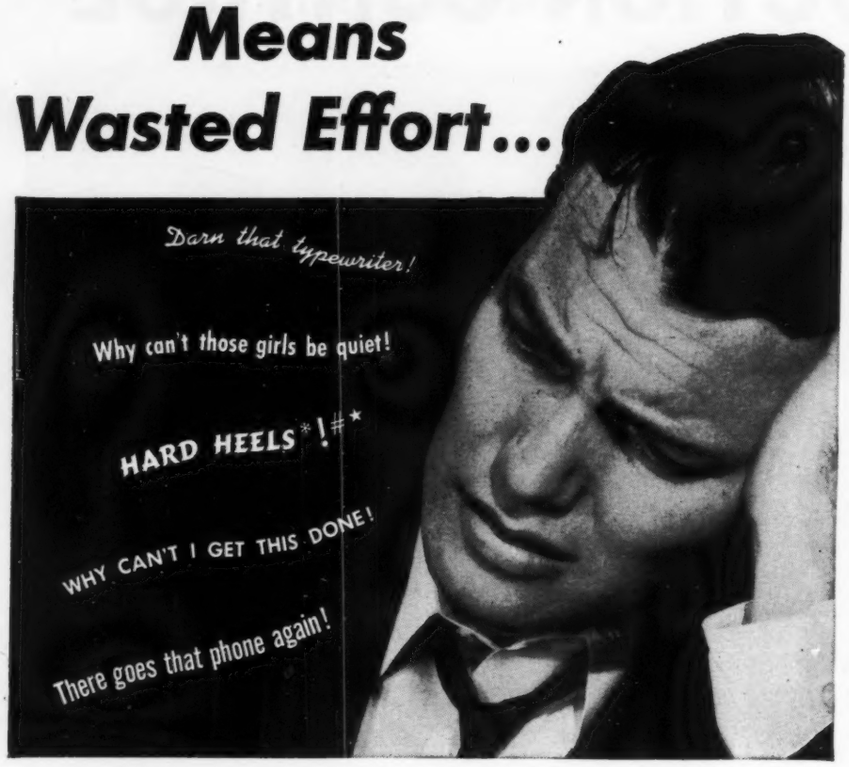
★

Equip Every War-Production Machine with VEEDER-ROOT COUNTING DEVICES

VEEDER-ROOT INCORPORATED • HARTFORD, CONNECTICUT

OFFICES IN: Boston, Chicago, Cincinnati, Cleveland, Detroit, Greenville, S. C., Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Montreal, Buenos Aires, Mexico City. In England: (address on request.) In Canada: Veeder-Root of Canada, Ltd., Montreal

Needless NOISE Means Wasted Effort...



STOP IT with a J-M Acoustical Treatment!

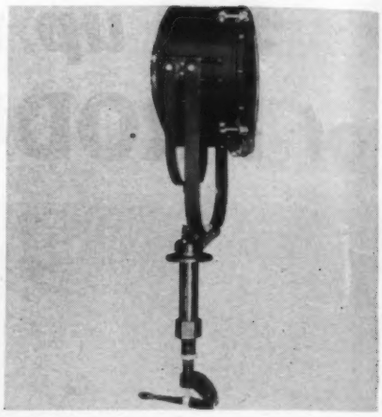
NO WORKER IN A PLANT OFFICE can do his job efficiently today with uncontrolled noise tearing at his nerves. This condition can easily cause serious errors . . . slow up work at a time when every minute counts.

With Johns-Manville Acoustical Materials, you can give plant office workers the quiet they need at surprisingly low cost. Fireproof, unusually durable, and applied with little if any interference with routine, these materials effectively absorb disturbing noise. And they quickly pay for themselves in increased efficiency, fewer errors and improved morale!

FOR COMPLETE DETAILS, write for J-M Sound-Control Catalogue AC-26A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM JOHNS-MANVILLE

SOUND-CONTROL MATERIALS AND ACOUSTICAL-ENGINEERING SERVICE



are of sheet steel. Door and door frame are of cast iron with integrally cast hinge and lathe lugs. Door is clamped in position against a weathertight heat-resisting gasket or graphitized asbestos. Lens is of heat and impact resisting polished glass mounted against a weathertight gasket and held in position by steel spring clips. Primary reflector is a 19-in. parabolic commercial-precision mirror coated with silver and sealed by an electrolytic coating of copper and synthetic material. Secondary reflector is of polished metal too and provides high reflectivity.

Body is supported in a steel bow with locking handles to position the luminaire at any fixed elevation and rotation. Socket assembly is the standard mogul bipost type rated at 50 amperes, 600 volts. It is normally fixed in position but is independently adjustable for elevation and rotation. Westinghouse Lighting Division, Cleveland.

Pump-Tank Extinguishers

Incendiary bombs are best controlled by a fine water spray played on the bomb during its period of activity. The average bomb requires about five gallons of water for successful control. Pump-tank extinguisher meets the industrial requirements for combating incendiary bombs, it is claimed. Is substantially constructed of galvanized steel, painted red. Double-action pump assures adequate water pressure to fight the bomb at a safe distance. Extinguishers are easily carried to the point

American Production is Speeding the Day of Victory—
and Century Electric Motors Aid Production

Photo by U. S. Army Signal Corps.

CENTURY MOTORS ARE AS TOUGH AS THE LAND BATTLESHIPS THEY HELP TO PRODUCE

They Withstand the Terrific Shock Loads and Power Demands of the Heaviest Machine Tools

★ The rugged construction of Century Motors, including ribbed frame and braced end brackets, provides the rigidity with which to withstand the heavy shock loads of forming, forging, shaping, and shearing heavy plates and other heavy parts used in armament production.

Century Motors can take the heaviest shocks; working on three-shift production day after day — they're as tough as the land battleships they help produce.

A wide variety of sizes and types of Century Motors — those with standard general purpose characteristics and also those with special speed torque characteristics — are found on machine tools ranging from those heavy brutes forming the heaviest armor to those delicate machines producing the finest precision instruments.

The Century Sales Engineer near you will gladly help you select the right motor for your production machine or for application to any product you sell. His experience will save time and money — call him today.

Century MOTORS

CENTURY ELECTRIC COMPANY
1806 Pine Street St. Louis, Missouri
Offices and Stock Points in Principal Cities

280

One of the Largest Exclusive Motor and Generator Manufacturers in the World

AMERICAN MONORAIL
EQUIPMENT

Helps Conserve Energy and Increases Efficiency

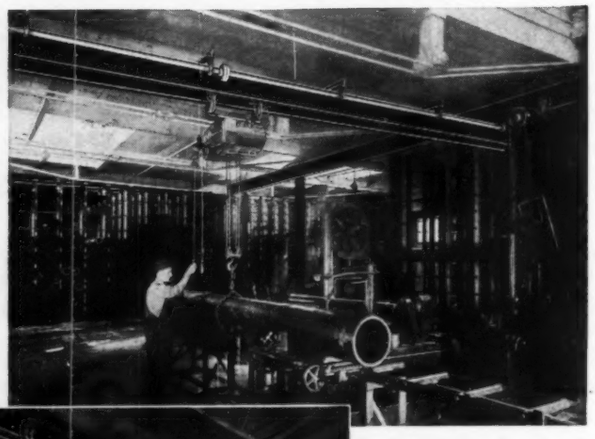
AMERICAN MONORAIL Overhead Handling Systems play a vital part in speeding up production in hundreds of plants working on war materials.

American MonoRail Equipment relieves men from lifting and carrying and enables them to give full time to production—keeps materials and products on scheduled routes, without congestion, delay and damage in transit.

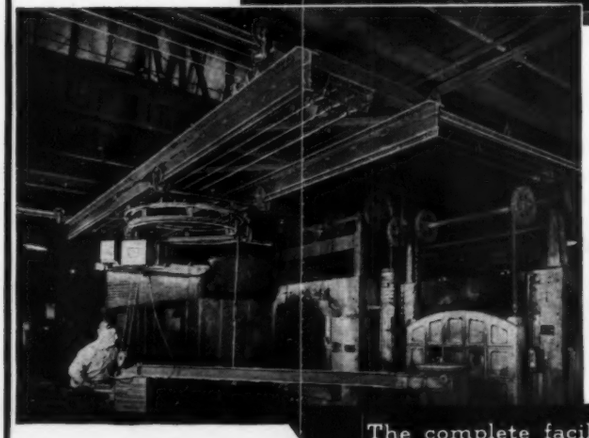
American MonoRail Equipment is engineered to meet the particular requirements of each problem. Supplied for manual, electric, or automatic operation. There is no delay or shutdown during installation. Let an American MonoRail Engineer show you how it can be done in your plant.

THE AMERICAN MONORAIL CO.
13114 ATHENS AVENUE ★ CLEVELAND, OHIO

• Easy movement of hard-to-handle loads on a simple power operated MonoRail crane.



• Special double bridge crane with swivel features for quick removal and quenching annealing pots.



WRITE FOR Blue Book illustrating hundreds of MonoRail installations.

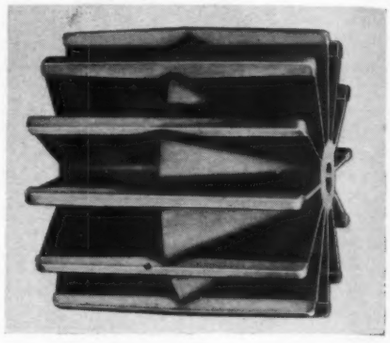
IF YOU *Plan* TO BUILD

The complete facilities of our engineering staff are at the disposal of any company—their architects or engineers—planning to expand or construct new buildings. This service is yours for the asking.

where the bomb lodges; operation is simple. A large refill opening at the top facilitates quick replenishing of water, during operation if necessary. Supplied in two capacities, 2½ and 5 gallons. Buffalo Fire Appliance Corp., 44 Central Ave., Buffalo.

Tail Pulley

Wing type Belt Saver tail pulley is claimed to be simple in design, efficient in operation. Wing and cone design makes it impossible for abrasive or other material to lodge between the belt and the pulley. Particles that fall on the belt enter between the wings of the pulley and



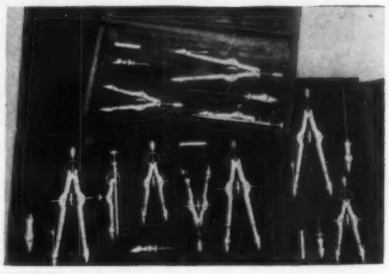
are deposited at the outside of the pulley as it rotates. Efficient on elevators or conveyors handling wet or sticky materials and for use on a belt conveyor or elevator operating in a freezing temperature. Moisture that freezes to the belt is automatically broken and discharged to the side of the pulley. Is interchangeable with any standard-sized pulley. Sprout, Waldron & Co., Muncy, Pa.

Scale Preventive

Micromet is designed to prevent scale and eliminate "red water" in air conditioning units and mechanical washing equipment. It is a glassy sodium phosphate, made of food-grade material to a closely controlled composition, crushed and sized. When placed in cold water it dissolves at the rate of 25 percent per month. It is fed into the raw water line by a simple pot-type feeder individually made to conform to the requirements of the system in which it is being installed. Calgon, Inc., 323 Fourth Ave., Pittsburgh.

Drawing Instruments

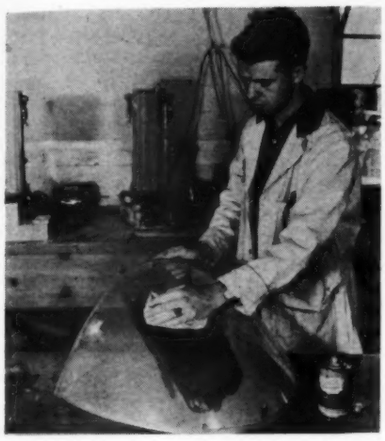
Available in three combinations of bows, drop bows, and pens, a line of American-made drawing instruments has recently



been announced. Known as Vemco, instruments are said to embody an open truss design which increases strength and rigidity while cutting weight. Each bow has a center-screw adjustment which articulates with the legs by cylindrical nuts. The legs bear upon a double-grooved hinge pin of broad base. Sets are available in one, two, and three bow combinations complete with dividers and pens. V. & E. Engineering Co., Pasadena, Calif.

Plastic Cleaner

Asco plastic cleaner removes grease, masking tape gum, paint, raw rubber, dumdum, rubber adhesive, or any foreign substance from plastic surfaces, it is claimed. Special features are its quick cleaning ac-



tion and the small amount necessary to do the work. Aircraft Specialties Corp., 601 S. Anderson St., Los Angeles, Calif.

Voltage Regulator

Especially designed for feeder circuits where exacting voltage regulation requirements must be met, and liquid cooling is undesirable, air-cooled voltage regulator for indoor use, known as type SA, is intended for single-phase feeders, 2400 volts, 50 to 300 amps., and 4800 volts, 25 to 150 amps. Single-phase units can be used in banks on polyphase circuits, two units

"RAISE YOUR SIGHTS"
on the Production Target

Five, ten, twenty times the light intensities formerly employed are helping American industry to meet the greatest production schedule the world has ever witnessed.

If you haven't yet taken advantage of the tremendous lift in productivity and morale that is inherent in higher intensities thru the application of cool, glare-free Fluorescent light, don't put it off any longer. Champion engineers consider it a patriotic duty to assist you in every possible way.

CHAMPION
Fluorescent Lamps

are in every respect worthy of the name "Champion" that has stood for quality, dependability and economy in electric lamps since 1900.

A Champion Lamp distributor specially selected for his ability to provide you with prompt and intelligent service is at the other end of your phone.

Champion Lamps are licensed under General Electric Company fluorescent and incandescent lamp patents

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

SIMPLE—but it stopped a modern guillotine!

Not so long ago when ground crews swarmed over any plane getting it ready for the next flight, one danger was always present. Unless the magneto was grounded, any movement of a propeller might start the motor—with unexpected and tragic results.

It was not enough to close the switch in the pilot's cockpit. Somewhere else the magneto circuit might be broken for ordinary repairs and servicing.

Somebody had to provide a safety device that would work 100% of the time. Cannon engineers developed the electrical connector you see above, now used throughout the aviation industry. When the magneto cable is disconnected for any reason, a simple, positive mechanism closes the circuit *automatically.* Nobody has to remember to do anything. The motor cannot start accidentally. Arms and heads are saved!

This is but one of scores of Cannon developments for the highly specialized needs of all aircraft builders. Twenty-seven years of peacetime experience in serving many industries has made Cannon America's leading designer and manufacturer of precision type electrical connectors.

Wherever electrical connections must be made quickly and with positive security, Cannon has a specialized plug to do the job. That's why Cannon connectors are standard equipment in America's fighting planes, in radio, motion pictures, railroad rolling stock, tanks and hundreds of war and civilian uses.

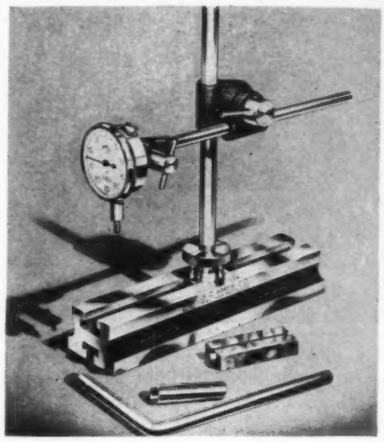
CANNON ELECTRIC
DEVELOPMENT COMPANY
Los Angeles • California

in open delta on 2400 or 4800 volt 3-wire circuits, or three 2400-volt units on 4160 volt 4-wire circuits.

No liquid cooling is required, and winding insulation is flame resisting to reduce hazard from fire or electrical failure. Air cooling is by natural conversion. Outside air enters through two openings on each side of the regulator, passing upwards through air ducts and is discharged at the top of the regulator. Unit has a stator and rotor, with the primary or shunt winding wound on the rotor and the secondary or series winding on the stator. Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Dial Test Indicator

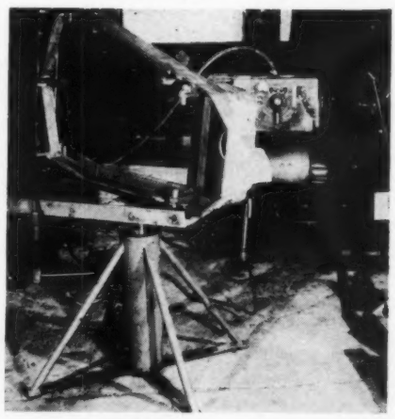
Testing outfit for machinists, toolmakers, inspectors, and assemblers, to determine flatness of surfaces, roundness and trueness of revolving parts, relative heights and thicknesses. Adjustable to any posi-



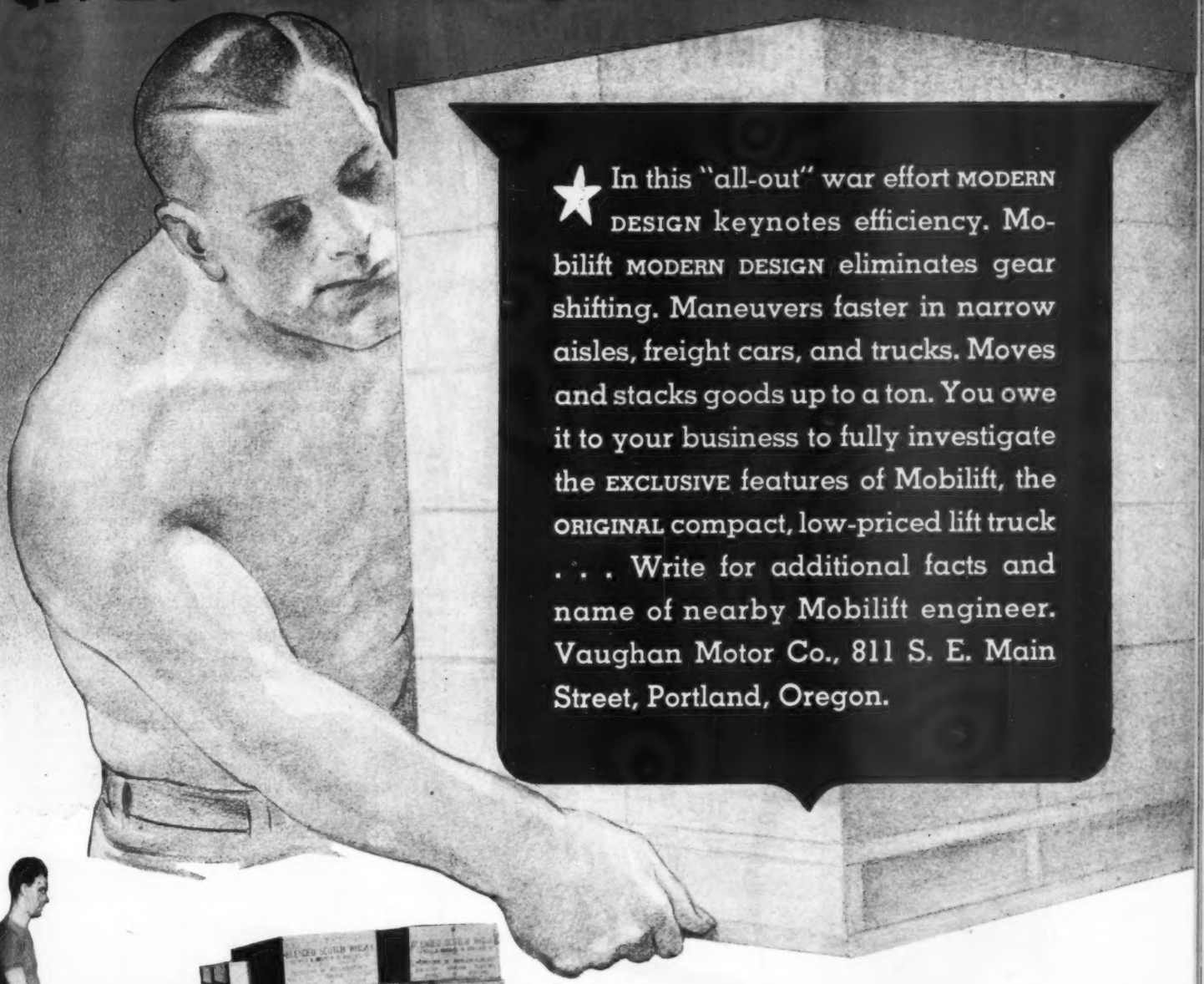
tion. Sturdily built. Standard indicator is Ames No. 203 with 0.125-in. spindle travel, graduated in thousandths and half-thousandths and numbered 0-25-0. B. C. Ames Co., Waltham, Mass.

Hydraulic Welding Table

With a hydraulic elevating welding table with revolving top the operator can keep work at the most convenient welding height by a foot-operated hydraulic pump. Work also can be turned to the most convenient position. Standard stock-size table has a capacity of 2000 pounds, plat-



MOBILIFT MODERN DESIGN GIVES MAXIMUM PERFORMANCE



★ In this "all-out" war effort MODERN DESIGN keynotes efficiency. Mobilift MODERN DESIGN eliminates gear shifting. Maneuvers faster in narrow aisles, freight cars, and trucks. Moves and stacks goods up to a ton. You owe it to your business to fully investigate the EXCLUSIVE features of Mobilift, the ORIGINAL compact, low-priced lift truck . . . Write for additional facts and name of nearby Mobilift engineer. Vaughan Motor Co., 811 S. E. Main Street, Portland, Oregon.

MOBILIFT

MOVES MATERIALS LIKE A GIANT

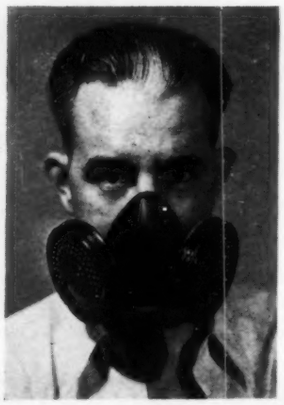
TURN TO THE 2 LEADERS.

FOR SAFE, COMFORTABLE, DURABLE

DUST PROTECTION!

THE M.S.A. DUSTFOE RESPIRATOR

●First in favor where compact shape, light weight and top wearing ease are demanded, coupled with full U. S. Bureau of Mines-approved protection against all toxic and nuisance dusts, this simple-to-care-for respirator's modern features are fully described in Bulletin No. CM-5.



THE M.S.A. COMFO RESPIRATOR

●Enjoying greatest popularity for sturdy strength and comfort, with guarded large-area twin filters, flexible molded facepiece and foolproof exhalation valve, the M.S.A. Comfo combines ability to "take it" with official U. S. Bureau of Mines-approval for All-Dust protection. Write for the details in Bulletin No. CR-5.

MINE SAFETY APPLIANCES COMPANY

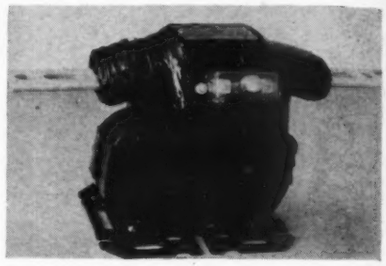
Braddock, Thomas and Meade Streets, Pittsburgh, Pa.

DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

form size 30x30 inches, lowered height 26 inches, elevated height 40 inches. Table is portable, although it is mounted on a floor base rather than on casters. Lyon-Raymond Corp., 935 Madison St., Greene, N. Y.

Indoor Current Transformer

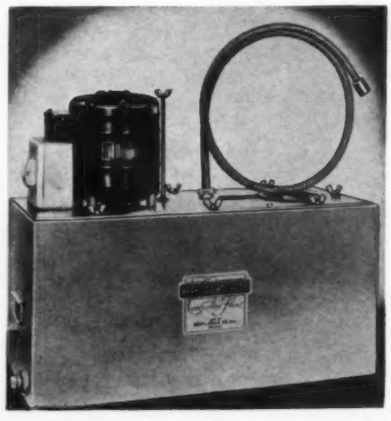
Standard type CT indoor current transformers with Hipersil core have a current rating of from 10 to 800 amperes primary and 5 amperes secondary; voltage ratings are 5, 8.7, and 15 kv. Definite primary terminal dimensions are set for the distance between centers of the outside ter-



minal holes, the size of the hole, the size of the slot, the distance from the base to the underside of the terminal, and the over-all height from the mounting base to the top of the transformer. Consequently, any standard type CT transformer is interchangeable with any other in its voltage class, regardless of current rating. Westinghouse Elec. & Mfg. Co., Sharon, Pa.

Coolant Pumps

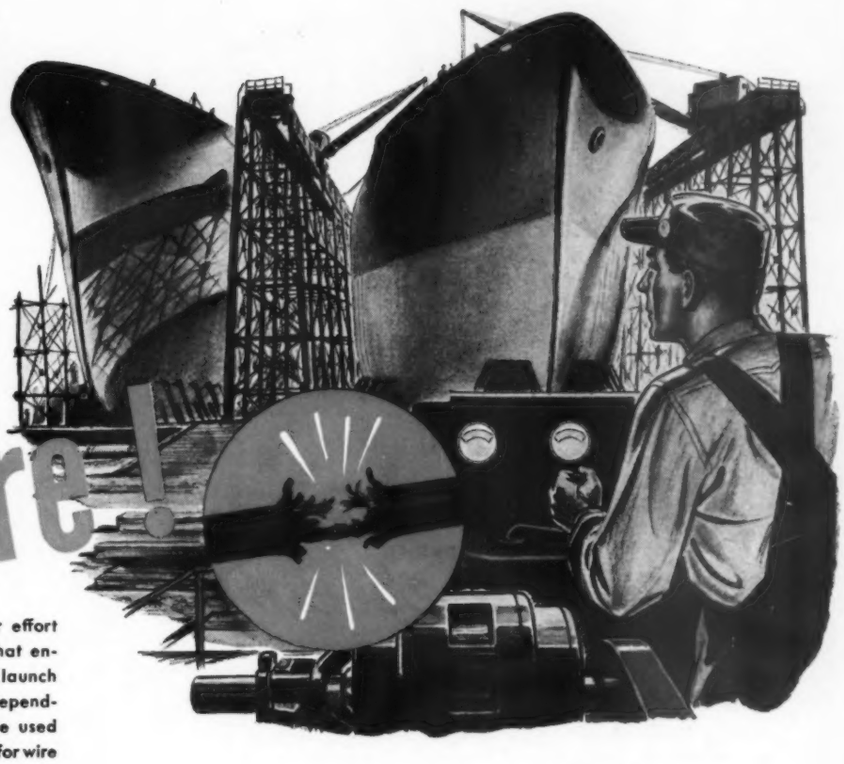
Three larger-capacity portable coolant pumps for automatic application of coolants to cutting tools are announced. Designated as heavy-duty "A" series, pumps G-2A, G-3A, and G-4A are designed to prolong tool life, speed up production, and lower operating costs, according to the manufacturer. Features include complete portability, controlled flow from a few drops to full stream, baffle plate construction, forced settling fixture to keep



coolant fluids clean at all times, larger tank capacity (10 and 12½ gal.) to eliminate frequent coolant changes, ball-bearing type motors, easily replaced driving gears, clean-out plug for quick tank cleaning, flexible power shaft coupling, and easy

They can't let it happen here!

The plucky merchant marine, strongest link between the United Nations, puts its trust in dependable wires and cables of copper for intercommunication systems, for engine controls, and often for steering. Wire failure would be serious.



or here!

Equally important to America's war effort is the safeguarding of the power that enables our shipyards and plants to launch better than a ship a day. Here too, dependable wires and cables of copper are used for distribution of electrical power... for wire failure would interrupt production, itself.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

Today . . . Anaconda Products are pre-empted for the toughest wiring jobs in war production. Anaconda Wire & Cable Company is devoting its production wholeheartedly to our country's war effort . . . turning out the most modern types of copper wire and cable, each engineered to fit the job . . . and doing it *seven days a week!*

Meanwhile . . . Anaconda Wire & Cable Research carries on: Working with redoubled effort are the research laboratories of the Company . . . investigating and testing materials and methods . . . improving existing products, developing new ones.

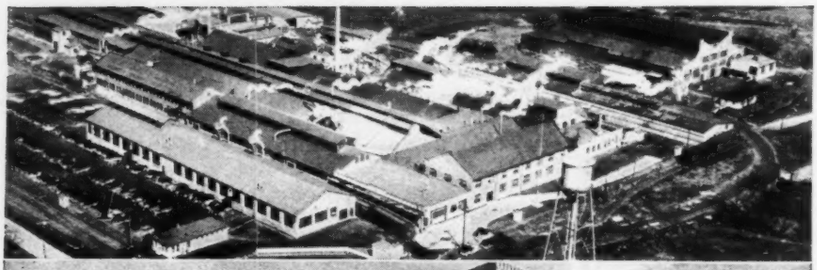
The benefits of this intensive program of original research today are going into our country's war effort. But when the emergency is ended they will be available to industry everywhere . . . a pool of practical information, of product development and improvement . . . even finer wires and cables of copper. 42287

ANACONDA
from mine to consumer

This familiar trade-mark symbolizes the best efforts of modern research and production.

GENERAL OFFICES: 25 Broadway, New York
CHICAGO OFFICE: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Co.
Sales Offices in Principal Cities

ANACONDA WIRE & CABLE COMPANY



Carey
BUILT-UP ROOFS
over America!

PROTECTING HUNDREDS OF MILLIONS OF DOLLARS INVESTED IN VITAL PLANTS AND EQUIPMENT THROUGHOUT THE NATION

Industry knows that CAREY Roofs make good. A study of the records of thousands of Carey Built-Up Roofs shows that many are still on the job after 25, 30 and even 35 years of service.

The real reason for this exceptional service is simple and logical—over a half century of manufacturing experience, supported by serious scientific research.

Research, with CAREY, has never been "window dressing". For years CAREY has supported a research fellowship at the great Mellon Institute, University of Pittsburgh. And CAREY maintains, at its home plant, one of the best-equipped and best-manned research laboratories in the country, devoted to the betterment of roofings and other building materials. As a result of this research, numerous U. S. Patents have been issued, covering basic improvements in roofing materials and their method of production. The practical story of this progress is being told in longer wear and more economical service, on roofs all over America.

In these critical war days, dependable roof protection is doubly important. Whether you require new roofs, or re-roofing jobs, it will be to your advantage to discuss your needs with a Carey representative. A nationwide organization of experienced roofing contractors is at your call.

Write Dept. 31.

THE PHILIP CAREY MFG. COMPANY

Dependable Products Since 1873

LOCKLAND - - - CINCINNATI, OHIO

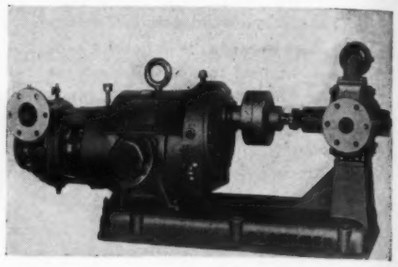
In Canada: The Philip Carey Company, Ltd. Office and Factory: Lennoxville, P. Q.

1. Ames Baldwin Wyoming Co.
2. Allegheny Ludlum Steel Corp.
3. The Florence Stove Company

access to all working parts. On machine set-ups requiring four to six points of coolant application, each has its own coolant flow regulator. Gray-Mills Co., 213 W. Ontario St., Chicago.

Dual-Purpose Pumping Unit

A combination rotary-centrifugal dual pumping unit, mounted on a cast bedplate, is powered by a 4-hp., 3-phase, 60-cycle motor with a gearhead on one end



to drive a rotary pumping unit, and a shaft extension on the other end, connected direct to a centrifugal pump. Rotary pump has a capacity of 44 g.p.m. at 50 psi, handling lube or fuel oil. The centrifugal pump has a capacity of 75 g.p.m. at 25 psi handling water. Blackmer Pump Co., Grand Rapids, Mich.

Gate Protection

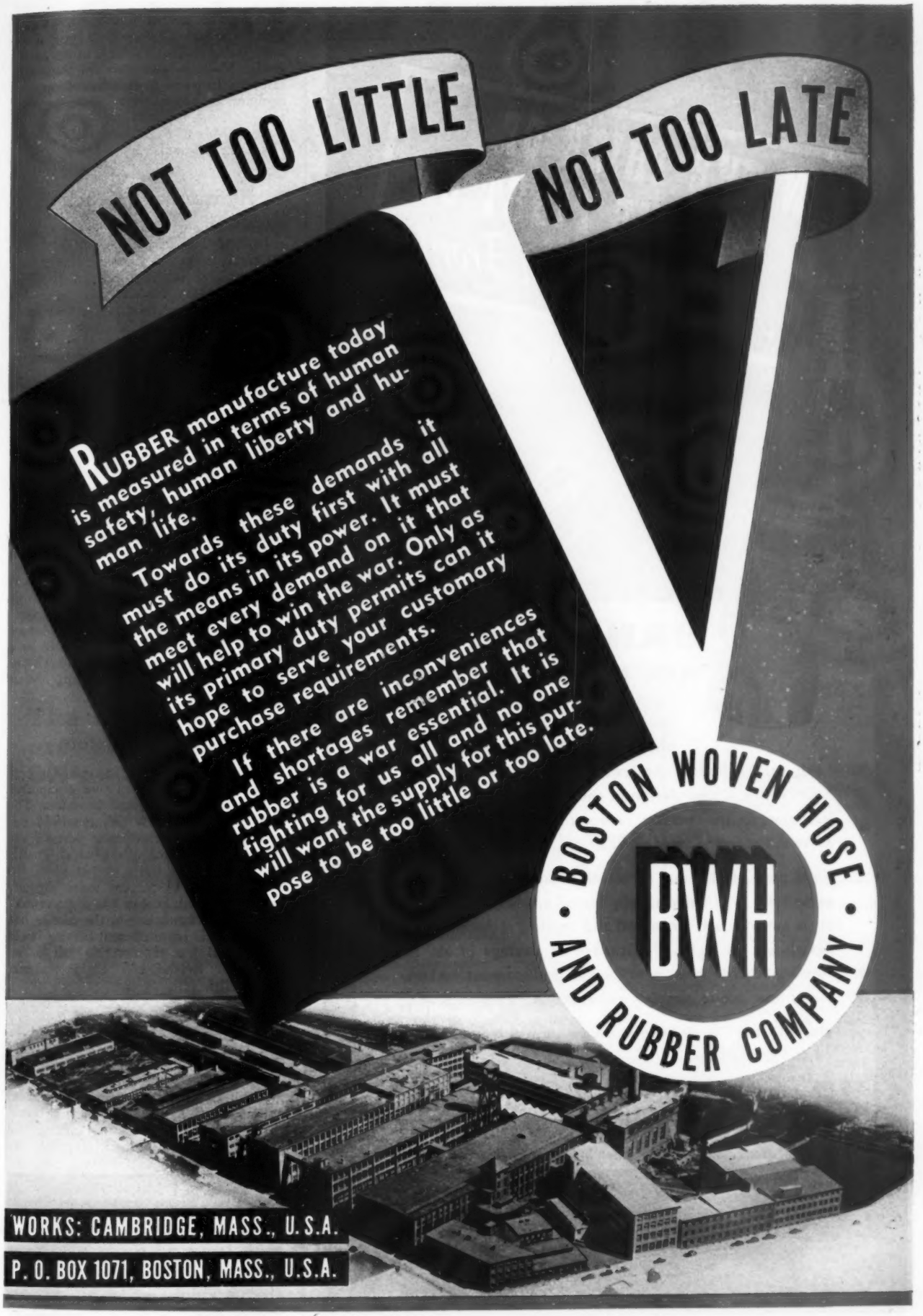
Turnstile systems are designed for every plant gate purpose. Some are designed as traffic controllers; others register entrance; operate by tokens which classify and register different classes of employees; can be controlled remotely or register remotely; can automatically permit one-way entrance

or exit but are impenetrable in the other direction, or they can be used to handle both entrance and exit.

Automatically operated, giving added protection because guard can devote all his attention to identification and use both hands for the examination of packages, etc. Perey Mfg. Co., 101 Park Ave., New York.

Shower Cabinet

Using non-critical materials, shower cabinet known as Victory meets latest government specifications. Walls are made of

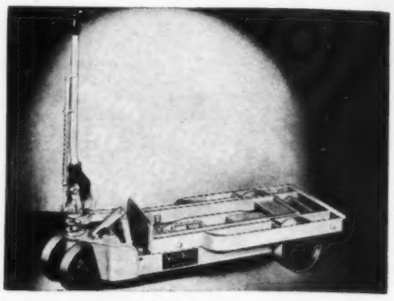

NOT TOO LITTLE
NOT TOO LATE
RUBBER manufacture today is measured in terms of human safety, human liberty and human life.
Towards these demands it must do its duty first with all the means in its power. It must meet every demand on it that will help to win the war. Only as its primary duty permits can it hope to serve your customary purchase requirements.
If there are inconveniences and shortages remember that rubber is a war essential. It is fighting for us all and no one will want the supply for this purpose to be too little or too late.
BWH
BOSTON WOVEN HOSE AND RUBBER COMPANY
WORKS: CAMBRIDGE, MASS., U.S.A.
P. O. BOX 1071, BOSTON, MASS., U.S.A.

IN THE THICK OF
THE FIGHT ON
All Production Fronts
HANSEN MFG.
HANSEN Push-Tite
AIR HOSE COUPLINGS
Hansen Push-Tite air hose couplings have played an important part in the phenomenal production records now being established by the leading industrial plants in this country. The unique design of these couplings means far less effort for the operator, saving of air, time and a general all 'round speeding up of production.
Slight push of plug into socket—it is connected and at the same time air is automatically turned on—slight pull back, air is automatically turned off and coupling is disconnected. Absolutely air tight—no leakage or wastage of air. No twisting of parts in order to connect or disconnect, no kinking of hose due to complete swivel action.
Hansen Push-Tite air hose couplings are widely used for air, oil and grease lines.
Hansen MANUFACTURING CO.
1786 E. 27th ST. • CLEVELAND, O.
Send for free catalog on the Hansen Industrial Air Line Equipment.

hard-pressed, treated fiberboard. Receptors are reinforced, non-slip, pre-cast cement composition. Frame is of galvanized steel. Made in one standard size, with cast-iron drain and soap dish, and optional equipment—shower head, valves, curtain rod, curtain—is easily and quickly installed. Milwaukee Stamping Co., South 72nd St., Milwaukee.

Hydraulic Lift Truck

Recently announced is the development of a 10,000-lb. capacity Weld-Bilt hydraulic lift truck, Model L. Designed and built for mobility and efficiency in handling extremely heavy loads. Heavy duty hydraulic unit is interchangeable and easily removed without special tools. Narrow



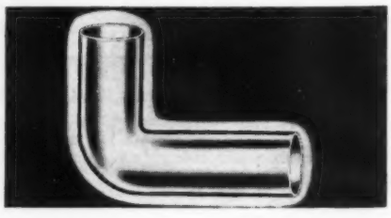
and wide platform sizes. Moving parts are equipped with ball or roller bearings for easy handling. Steel frames are completely arc-welded and heavily cross-braced for rigidity and strength. Available in a wide variety of sizes, heights, and widths. West Bend Equipment Corp., West Bend, Wis.

Manifold System

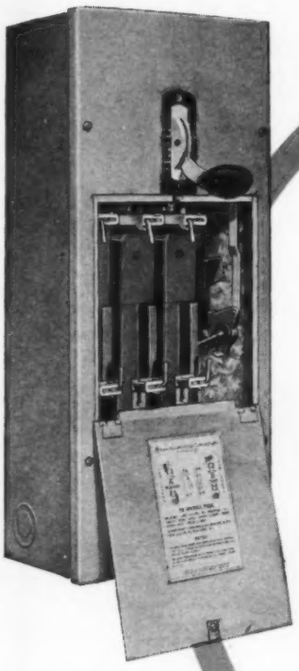
Increasing the capacity and efficiency of existing zeolite water softener equipment is accomplished by a manifold system. The principle upon which this manifold system operates is such that it permits the use of a deeper zeolite bed, which greatly increases the soft water output of a softener. Up to 44 percent more capacity can be obtained; zeolite loss is prevented; packing and channeling of the zeolite bed are prevented; more efficient brining is obtained; and less regenerating salt is required, it is claimed. Elgin Softener Corp., Elgin, Ill.

Plastic Flush "L"

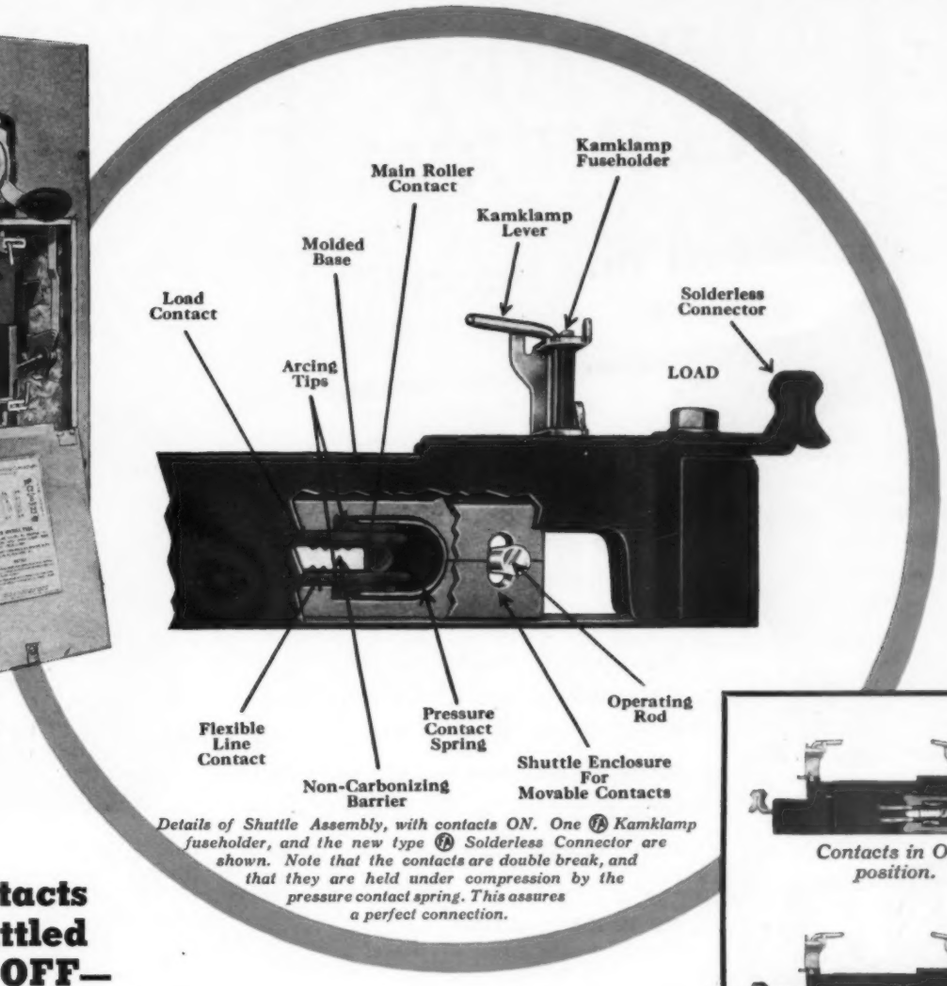
Critical metals are being conserved by a plastic flush elbow for connecting the tank to water closets. It provides strength and resistance with lightness. It does not break, crack, nor dent in the usual packing and handling with tools. It is leakproof, im-



A Revolution in Safety Switch Design!



100 Amp., 575 Volt Ⓕ SHUTLBRAK Switch, Cat. No. SA-10633.



Details of Shuttle Assembly, with contacts ON. One Ⓕ Kamklamp fuseholder, and the new type Ⓕ Solderless Connector are shown. Note that the contacts are double break, and that they are held under compression by the pressure contact spring. This assures a perfect connection.

Contacts in OFF position.

Contacts in MAKE or BREAK position.

The contacts are shuttled ON and OFF—

that's why it's called the

Ⓕ SHUTLBRAK SWITCH

For motor circuits, service entrance, or any installation requiring an operating switch, this heavy duty industrial switch has new advantages.

The roller type main contact and auxiliary contacts are enclosed in an insulated shuttle. This shuttle assembly in turn is entirely surrounded by insulating material. There is an arc resisting barrier at all times between the line and load contacts — and contacts are held under compression in ON position. Silver plated current carrying parts insure low resistance. Properly engineered springs assure quick make and quick break. It is equipped with Ⓕ Kamklamp (pressure type) fuseholders for either ferrule or knife-blade types of fuse terminals, and with the new Ⓕ Solderless Type Pressure Connectors.

As an additional safety factor, Type A is equipped with an interlocking arrangement between the switch operating lever and the door of the fuse compartment. The door cannot be opened when the handle is in the ON position. (Type B does not have this interlocking feature.)

Enclosures have ample wiring space at top, and AT REAR of the switching mechanism. Attractively finished in pearl gray enamel.

Front operated, the Ⓕ Shutlbrak Switch may be used singly, banked in groups, or assembled in compact, well designed switchboards and panelboards.

Capacities: 30 to 1200 amp., inclusive, for 250 volts AC or DC, and 30 to 600 amp., 575 volts AC, in 2, 3 and 4 poles. Approved by Underwriters' Laboratories.

For detailed information, and suggested specifications for Shutlbrak Switches, Panelboards and Switchboards, write for Bulletin No. 59 . . . Frank Adam Electric Company, St. Louis, Mo.

EST. 1891 — THE SIGN OF A BETTER JOB

Frank Ⓕ Adam

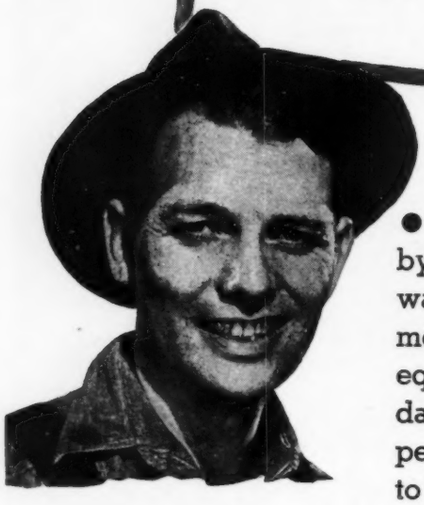
ELECTRICAL PRODUCTS

for Defense Industry

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

PROMPT DELIVERY*

"Saved our necks!"



● "Production at full speed by the 10th . . . or else! That was the job that faced us. It meant new materials handling equipment — and a delivery date we could absolutely depend upon. Again, we turned to P&H because we know they won't make a promise they can't keep. This time they beat the promise . . . and enabled us to keep ours!"

★ To meet the urgent need of the war program, P&H guarantees delivery date within ± 3%.

P&H TRAV-LIFT CRANES FOR INTERMITTENT SERVICE

Around production lines, assembly floors, warehouses, loading zones, and in countless other locations, P&H Trav-Lift Cranes provide swift, low-cost materials handling to speed the war effort. Designed for intermittent service, P&H Trav-Lifts are offered in a variety of sizes and types with capacities up to 15 tons. Write for bulletin H-13.

Awarded the Navy "E" for excellence in war production, P&H displays it also as a pledge of future effort.

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HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

pervious to water, iron, lime, sulphur, brine, or any other water content. No enamel, paint, or plating to chip, crack, peel, or tarnish. Available in size 4x6 inches, 2 inches outside diameter. Can be easily cut to shorter lengths on the job, without special tools. American Molded Products Co., 1753 N. Honore St., Chicago.

Non-Indicating Controller

Controller to be known as the Tag No. 42 has been recently placed on the market. Small in size, simple in construction, accurate in operation, suited to the majority of automatic control applications, it is claimed.

Smallest change of temperature at the

bulb is transmitted to ball air valve through the transmitting spring lever that multiplies the movement of the capsular spring. Air valve, in turn, resets the rate of flow through the diaphragm-actuated control valve in the steam line. Temperature and pressure models in a number of convenient ranges are available. C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn.

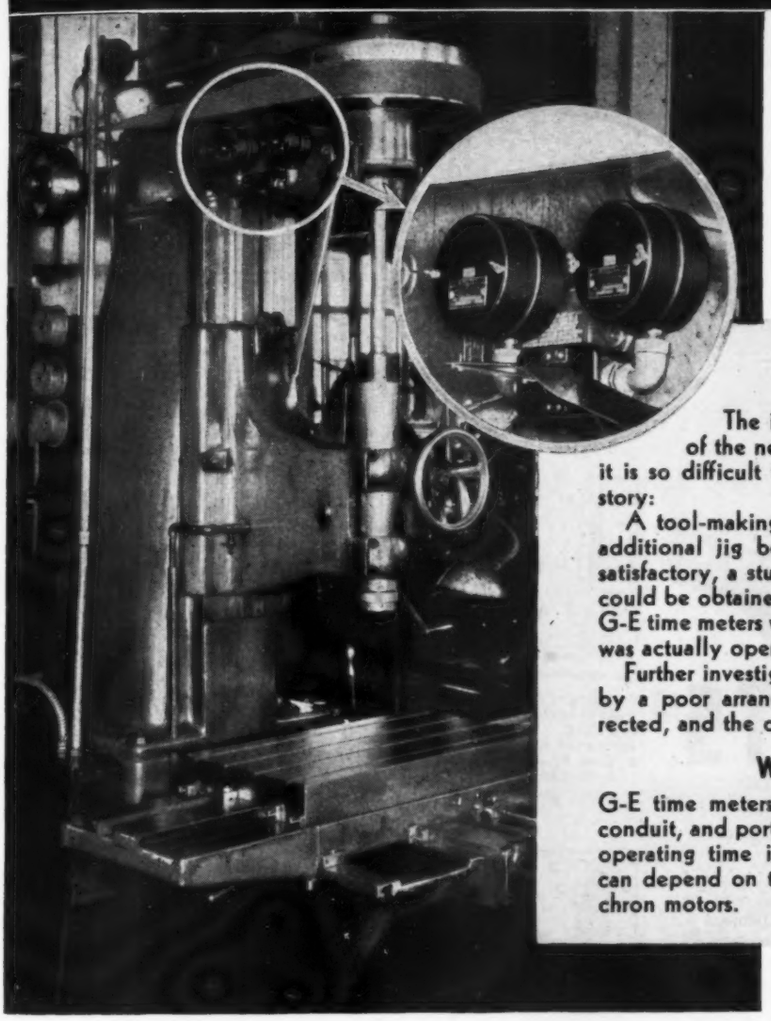
Idlers

Rex flat belt self-aligning idlers are sturdily built. No side guide rolls to impose unnecessary wear on the belt edge are used. Where excessive misalignment of a conveyor belt exists, caused by such factors as stretch or weave in the belt, uneven loading of material on the belt, or shifting of the conveyor frame, self-aligning idlers spaced at intervals between the stationary idlers will automatically bring the belt back to the central position, and avoid the possibility of serious injury to the conveyor belt, it is claimed. Chain Belt Co., 1600 West Bruce St., Milwaukee.

Floodlight

Glass floodlight, known as Type L-49, combining high reflectivity of silvered glass with resistance to shock has recently been announced. Although the reflecting surface is made of glass, it is shatterproof. Reflector is coated by electrolytically deposited metal which, together with an over-all backing of porcelain enamel, will

Time Meters Can Make Your Machines MORE PRODUCTIVE



Here's How . . .

1. A machine can be idle part of the time and go undetected. But a time meter—to measure machine use—will spot it. Then a changed schedule of work will utilize the machine more effectively.

2. Time meters will tell you when to service equipment. This helps to avoid costly delays and shutdowns.

Here's an Actual Case

The installation shown here is a typical example of the need for time meters—particularly now, when it is so difficult to get new machines in a hurry. Here's the story:

A tool-making department requested the purchase of an additional jig borer. Because delivery promises were unsatisfactory, a study was made to determine how more work could be obtained from this jig borer that was already in use. G-E time meters were installed; they showed that the machine was actually operating less than 50 per cent of the time.

Further investigation disclosed that the idle time was caused by a poor arrangement for setting up work. This was corrected, and the one machine now handles the entire job.

What Kind Do You Need?

G-E time meters are available—for every need—in panel, conduit, and portable types. They can be obtained to record operating time in hours, tenths of hours, or minutes. You can depend on their accuracy, for they are driven by Telechron motors.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

If It's TIME You Want to Save, MEASURE IT

Would you like to know how metered time is used in G-E factories? Our 16-page bulletin gives the story, including formulas for determining:

MACHINE UTILIZATION ★ JOB EFFICIENCY ★ MACHINE-CYCLE UTILIZATION

Also, it contains samples of metered-time reports and illustrations of typical G-E time-meter installations. To get your copy, just fill in and return this coupon.

GENERAL ELECTRIC

General Electric, Sec. B603-25
Schenectady, N. Y.

Gentlemen:

Please send me "Metered Time," GEA-1574, and your time-meter descriptive bulletin, GEA-3299.

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COMPANY.....

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CITY..... STATE.....

603-25-6500

FOR WAR PLANT Production AND Protection

PERMAFLECTOR

Enclosed FLOODLIGHTS

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Airfields
Army Posts
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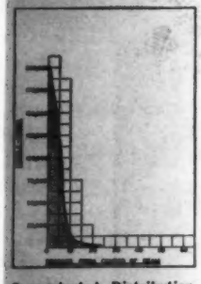
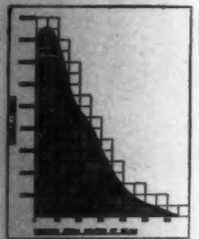
Pipe Lines
Power Stations
Railroad Yards
Substations
Viaducts



Concentrated Distribution Floodlights Numbers ST-1150-C, ST-1110-C. Addition of Stippled Cover Glass Provides Narrow Distribution.

Minimum of Critical Materials Used

★ Designed and built expressly for our vital war of production, these Permaflector floodlights project a flood of high intensity light which effectively serves to defeat the saboteur or to accelerate the output of war material. These new enclosed Permaflector steel floodlights are complete, ready-to-install and consist of a formed steel case equipped with hinge and clamps, heat-resisting cover glass, cast iron base, wire cord grip fitting, three-foot length of duplex wire, mogul socket and a 1,000-watt size Permaflector, the silver mirrored glass reflector which provides engineered light control from extreme concentration to extra broad spread. Preadjustment at the factory permits the use of 300, 500 or 750-watt lamps with the 1,000-watt size unit. Completely weather-proof and corrosion-resistant, these floodlights are ideal for all outdoor floodlighting applications. They may be mounted on a vertical or horizontal surface or attached to a pipe and adjusted to almost any position.



Broad Distribution of Floodlights Numbers ST-1050, ST-1010.

PITTSBURGH REFLECTOR CO.
403 OLIVER BLDG., PITTSBURGH, PA.

PITTSBURGH REFLECTOR CO. FM-7-42
403 Oliver Building
Pittsburgh, Pa.
Please rush complete data on Permaflector Enclosed Floodlights.
Name.....
Firm.....
Address.....

keep the glass from shattering even if it is broken by a severe blow. Reflector is joined to a metal socket housing, sealed with a heat-resistant gasket, which acts as a preventive against the entrance of water, making the floodlight corrosion-proof. Door glass and gasket fit solidly against the reflector for protection against water, dust, or dirt. Utilizes 300- or 500-watt lamps. General Electric Co., Schenectady.

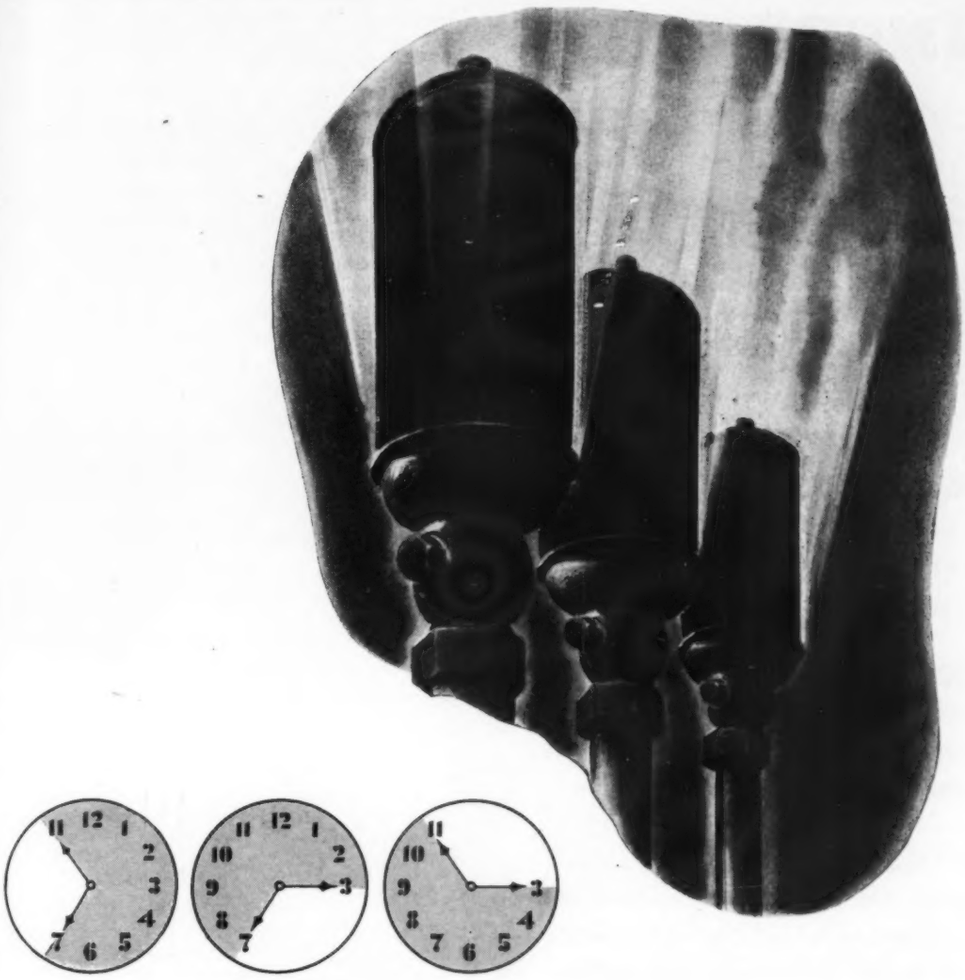
Chain Hoist

An improved standard type, spur-geared chain hoist is now being manufactured. Suitable for many applications in which speed, safety, durability, and efficiency are essential. Known as the Model Y-C hoist, it is equipped with a dust guard to protect the Weston type brake from dust and dirt. Heavy suspension plates provide unbreakable support between top hook cross-head and load sheave. These plates also directly support the saddle for double-chain hook-up. Load sheave is mounted on two heavy precision ball bearings, inclosed and protected from dust and grit. Built in six capacities, ½, 1, 1½, 2, 3, and 4 tons. Coffing Hoist Co., Danville, Ill.

Grease Traps

To save metal grease traps are being made with a vitreous glazed earthenware interceptor replacing the former cast iron unit. Known as V.G.E. Greaseptors, they are claimed to be better than 90 percent efficient at the rated capacity of 25 g.p.m.

The only metal used is for cover clamps and pipe connections. When handled with reasonable care traps are as durable



THREE SHIFTS A DAY

put a tremendous burden on plant machinery

TO HELP YOU KEEP YOUR EQUIPMENT IN SHAPE AND PRODUCING EFFICIENTLY, GULF OFFERS THE SERVICES OF A TRAINED LUBRICATION ENGINEER

WHEN plant whistles signal the end of a shift, a new shift continues the work. But America's busy machines are seldom afforded relief. For maximum production, they must be pushed without letup.

Here lubrication is a vital factor. For only with proper lubrication can machines produce to the full limit of capacity and operate continuously without breakdowns and mechanical troubles which interfere with production schedules.

Thus, in the interest of maximum assistance to the war effort, proper lubrication is a definite need in plant operation and a definite assignment for the petroleum industry. To carry out its part of this assignment, Gulf has made available an advanced lubrication engineering service.

Gulf lubrication engineers, in addition to thorough technical training and practical lubrication experience in the field, have a broad knowledge of related mechanical and processing problems. Result: You get effective help in keeping production rolling continuously — plus useful operating suggestions.

The services of a Gulf engineer—and the Gulf line of more than 400 quality oils and greases—are quickly available to you from 1200 warehouses in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

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OIL IS AMMUNITION — USE IT WISELY

INCREASE PRODUCTION of Your Present Plant with Veelos!

PROBLEM: **Plant expansion curtailed but production demands increased!** ***SOLUTION:*** **Switch to equipment that helps increase output of your present machinery—and in V-belting that means Veelos! Here are 3 of the reasons why:**

1 VEELOS REDUCES MACHINE DOWNTIME! With Veelos in rolls, V-belts can be replaced in the bat of an eye, keeping all belts on the drive and maintaining machine production.

2 VEELOS PERMITS OPERATION OF MACHINES AT MAXIMUM RATED CAPACITIES! Veelos *holds* machine speeds at maximum because link construction provides quick, easy adjustment to end slippage.

3 VEELOS DELIVERS FULL POWER! With Veelos link construction, equalized tension on *all* strands can readily be maintained, therefore *all* strands are constantly at work delivering full power.

This is only part of the story of Veelos production advantages. Let a Veelos sales engineer—especially trained in power transmission work—tell you the rest. Well worth hearing!

MANHEIM MANUFACTURING & BELTING CO., MANHEIM, PA.

VEELOS V-BELT
ADJUSTABLE to any length
ADAPTABLE to any drive

SAVE RUBBER!

End slippage and stretch with **OCTOPUS FLAT TRANSMISSION BELTING.** *Octopus combines greater resilience and more powerful grip... with great savings in rubber.*

KEYSTONE CANVAS STITCHED BELTING *provides great savings in rubber ... is the answer when you need conveyor or elevator belt fast. It can be shipped in a week or less.*

as cast iron. Afford resistance to thermal shock, necessary in a fixture carrying alternate surges of hot and cold water. Zurn Mfg. Co., Erie, Pa.

Intrusion Protective Systems

In the photo-electric protective system, Type A28L Control for outdoor and indoor use over long ranges, the light source projects a practically invisible light beam for 350 to 700 feet, and it is possible to surround power plants, defense factories, and other vital areas completely. If the

light beam is broken by intruders or saboteurs, the photo-electric control contacts close, thereby sounding alarms, operating a central station system, turning on floodlights, closing gates.

Control is provided with a latching unit, including a pushbutton station that may be located in the gatehouse, office, or other convenient point, which serves to latch the alarm in operation until the reset button is operated.

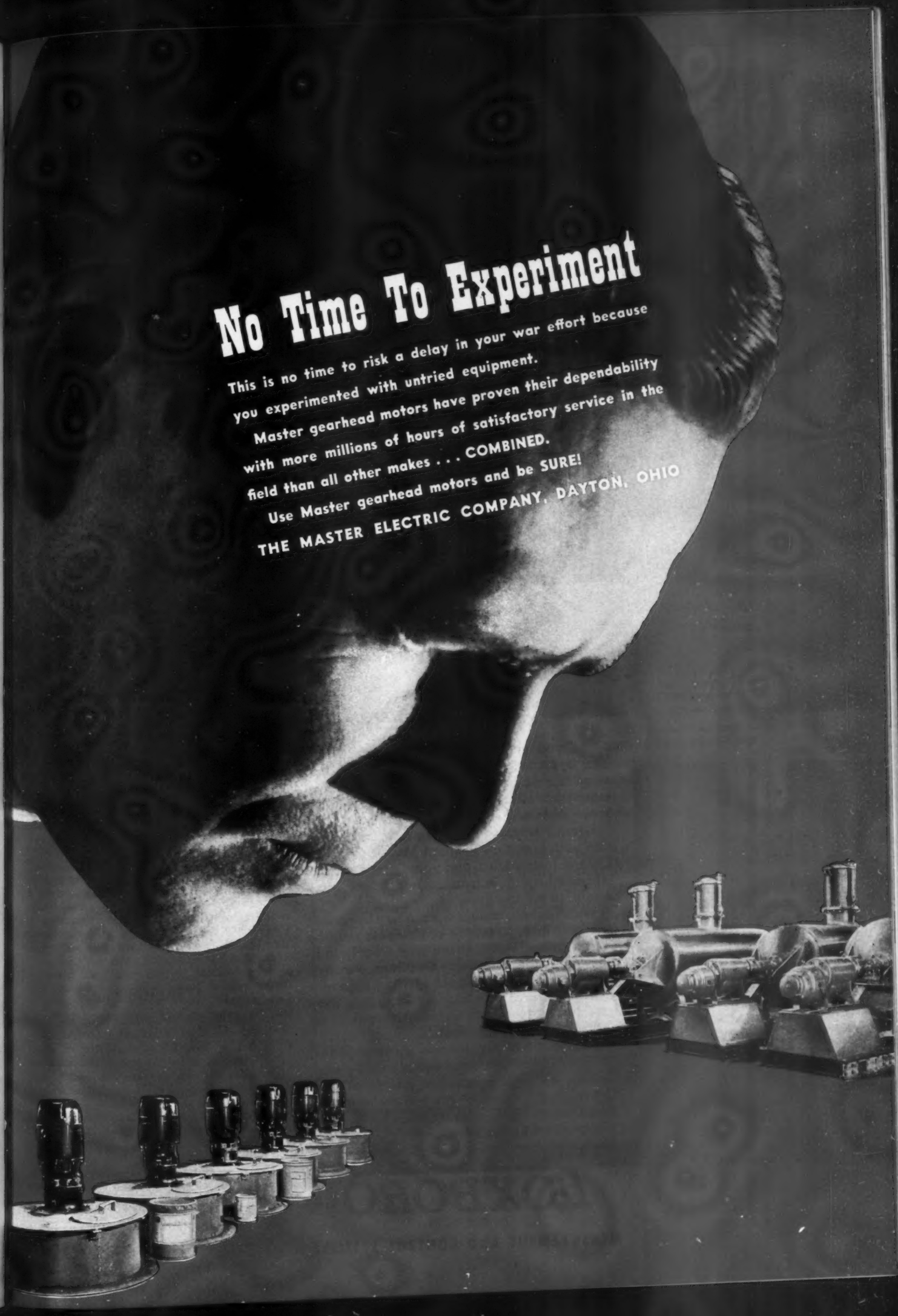
Unaffected by changes in local light and designed to operate 24 hours a day. Relay contacts are silver and will handle 15 amps. a.c. and 8 amps. d.c. Control operates from 115-volt, a.c. source of supply. Photoswitch Inc., 21 Chestnut St., Cambridge, Mass.

Hand Cleaner

A sulphonated castor oil skin cleanser has been added to line of products which aid in the prevention of occupational skin diseases. Sulpho hand cleaner has a base of sulphonated castor oil, combined with special wetting agents and other material, to remove dirt and grime, but at the same time, not defat the skin. It is especially designed for manufacturing processes which tend to dry out the skin. West Disinfecting Co., 42-16 West St., Long Island City.

Self-Operating Controllers

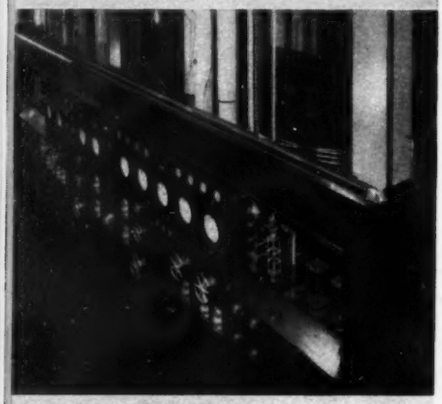
Self-contained and self-operating temperature controllers are announced. Used on applications such as hot-water storage heaters, hot-water storage tanks, canning retorts, exhaust boxes, textile dryers, scouring bowls, and so on. Controller uses no power outside the energy developed in its own system. Temperature changes at the element or bulb in the apparatus under regulation raise or lower the vapor pressure of the volatile liquid


No Time To Experiment
This is no time to risk a delay in your war effort because you experimented with untried equipment.
Master gearhead motors have proven their dependability with more millions of hours of satisfactory service in the field than all other makes . . . COMBINED.
Use Master gearhead motors and be SURE!
THE MASTER ELECTRIC COMPANY, DAYTON, OHIO

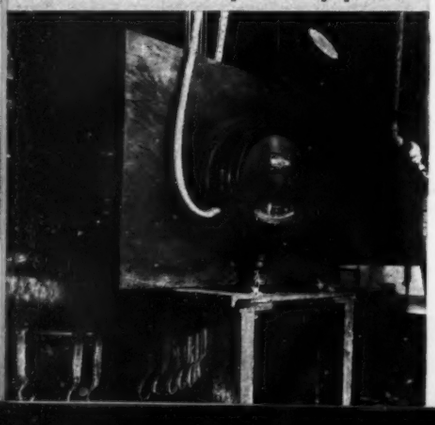
"GREEN HANDS"

can "man" your extra shifts!

Distillation of alcohol for munitions is practically an automatic process, under control of Foxboro Instruments.



Plating and anodizing are automatically held to specifications by Foxboro Temperature Controllers on process equipment.



ARE you putting your plant on a 24-hour operating basis? Here's how you can save the delays, spoilage and other "miseries" that often go with new shifts made up largely of inexperienced workers.

Equip every exacting step in your production with precision Foxboro Measurement or Control Instruments, and your "green" hands will need but little training to produce accurately, in paying quantity.

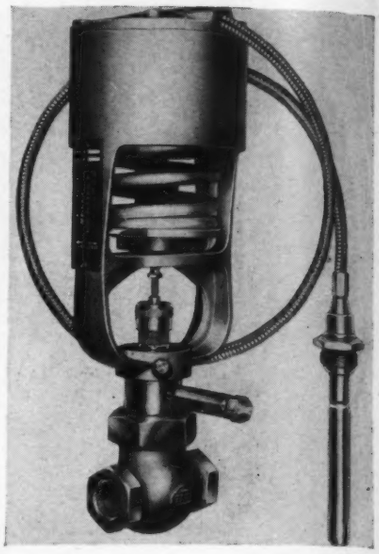
With Foxboro installations, every important temperature, pressure or flow-rate may be automatically measured and clearly indicated to guide operators. Continuous written records, too, may be supplied. And for many critical operations, manual control is completely replaced with automatic control by these unerring instruments.

Find out exactly *where*, in your plant, Foxboro Instruments can equip new "green" shifts to maintain production schedules without spoilage, waste or constant supervision. Write us, outlining your set-up. **The Foxboro Company, 24 Neponset Avenue, Foxboro, Massachusetts, U. S. A.**

FOXBORO

Reg. U. S. Pat. Off.

MEASUREMENT AND CONTROL SYSTEMS



in the tube system. A capillary connecting tube transmits the pressure change to the power bellows. The bellows expand and contract in response to the temperature changes at the bulb, position the steam valve, and so control the temperature. C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn.

Surface Wiring Devices

Moncor surface wiring devices for use in wiring cantonments, warehouses, temporary industrial buildings, war housing have been announced. These plastics devices can be end-connected or side-connected for surface wiring and back connected for concealed wiring. Line includes duplex covenience outlet, single-pole "T" rated switch, 3-way "T" rated switch, keyless lampholder, pull-chain lampholder, and junction box and rosette. Two accessories are provided to facilitate wiring—a back-connecting strap for use when cables are concealed and a combination clamp and continued ground strap for use with BX. They accommodate either No. 12 or No. 14 2- or 3-conductor metallic or non-metallic cable for surface wiring, or 12/2 and 14/2 non-metallic cable for concealed wiring. Synthetic insulated non-metallic cable can be used in either #12 or #14 sizes, 2- or 3-conductor, for surface or concealed wiring. Can also be used with knob and tube surface wiring. General Electric Co., 570 Lexington Ave., New York.

Humidifier

Available for textile mills, paper and printing plants, and other industries where control of humidity is important in manufacturing, or for the storage of hydroscopic materials such as chemicals and leather, is a recently announced industrial humidifier known as Carrier 43G.

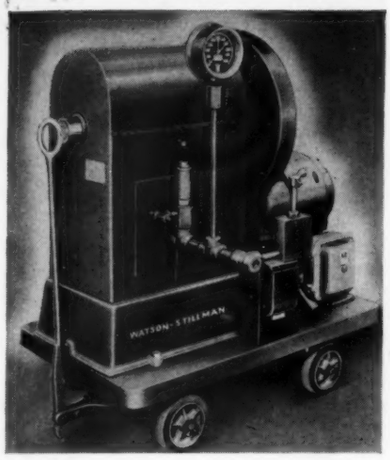
Unit is compact, easily installed, and low in power consumption, it is claimed. Ceiling-suspended for saving floor space, may be moved readily to accommodate equipment layout changes. Available in two capacities, 4800 or 6150 cubic feet

of humidified air per minute. Evaporates up to 96 pounds of water per hour.

Unit also cleans, circulates, and heats air in the winter. In summer may be operated to provide evaporative cooling, cleaning, and uniformly circulated air. Built in two sections to facilitate handling, unit includes fan and motor, humidifier pack, heating coil, drip pan, dampers, lint catcher, and housing. Carrier Corp., Syracuse, N. Y.

Pumps

A motor-driven, portable test pump is manufactured for use in testing boilers, tubing, and all kinds of high-pressure vessels. Entire unit, including motor, is mounted on a hand truck for portability, and all parts are inclosed for protection against foundry sand and other air-borne abrasives. The pump is a three-plunger,



vertical unit. Its ½-in. diameter plungers have a 2-in. stroke. Driven by a 3-hp. motor at 100 rpm, pump developes 8200 lb. per sq. in. maximum pressure at ½-g.p.m. capacity.

Equipment includes pressure gage, safety valve, needle valve for pressure regulation, motor, motor starter, disconnect switch, and 25 feet of rubber cable. The Watson-Stillman Co., Roselle, N. J.

Check Valves

Check valves, designated as William-Hager Flanged silent check valves, are manufactured of bronze, cast iron, steel, stainless, and monel metal for pressures varying from 150 to 2500 pounds. Sizes range from 1 to 20 inches. Have only two parts subject to wear—valve disk and seat. Both are easily removable and renewable, and the valve can be reseated without special tools. Spring ring is built as an integral part of the body. May be used in all pump lines handling water, oil, gas, acids, alkalies, and other fluids. The Williams Gauge Co., 2026 Pennsylvania Ave., Pittsburgh.

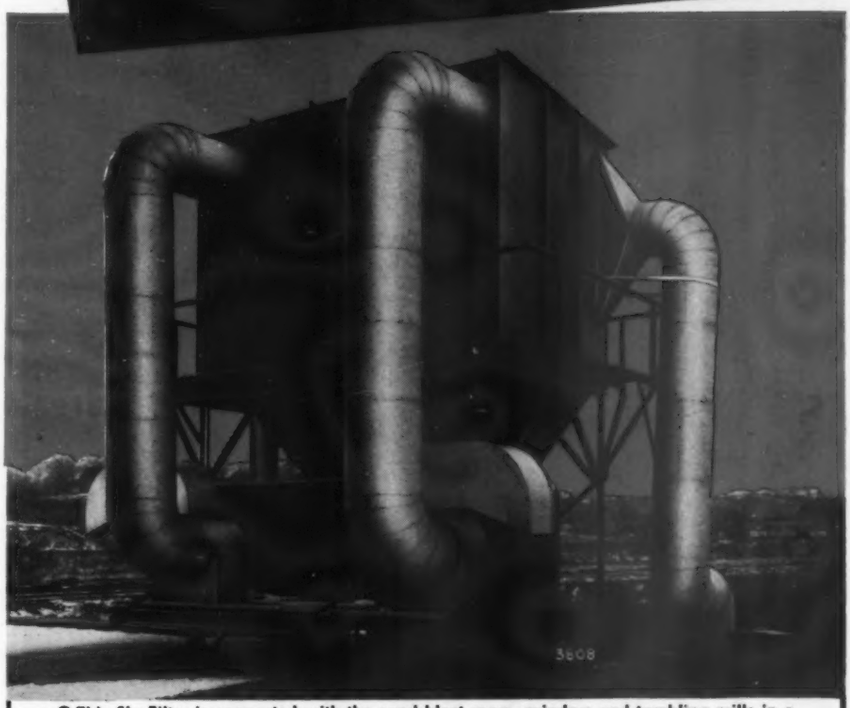
Seam Welder Control

Full-electronic timer and control designed for use with seam welders as well as spot welders is announced. Used with spot welding machines, Model 40 timer provides both single shot and pulsation type

SLY DUST COLLECTOR

FILTERS ALL DUST

OUT OF 16,000 CU. FT. OF AIR PER MINUTE



● This Sly Filter is connected with the sand blast room, grinders and tumbling mills in a large midwest foundry. Although handling the huge volume of 16,000 cubic feet of air every minute, it extracts *all the dust* so that the air discharged by the fans is absolutely clean.

TODAY'S greater and greater production requires more and more safeguards for men and machinery. Safeguarding against the harmful effects of dust is vitally important. In this, Sly Dust Filters are setting new records, suppressing and collecting 111 different kinds of dust in 56 different industries . . . a total of over 5,000 successful installations.

Among the outstanding features responsible for Sly popularity is the larger filter cloth area which results in greater filtering capacity per unit of space. Another is the automatic control, minimizing or removing entirely the human factor.

With Sly Dust Filters you can protect your men and machines from dust; in some processes save valuable materials by complete collection. *Yet, with all their advantages, Sly Dust Filters are not expensive.*

When writing please give full particulars so that we may explain just what can be accomplished.

THE W. W. SLY MFG. CO.

4755 TRAIN AVE. CLEVELAND. OHIO

SLY

INDUSTRIAL DUST CONTROL

KEEP 'EM ROLLING

SPEED with SAFETY

DARNELL
CASTERS & WHEELS

You are sure to find the exact caster or wheel for your individual requirements in the Darnell line.

DARNELL CORP. LTD., 60 WALKER ST., NEW YORK, N.Y.
LONG BEACH, CALIFORNIA, 36 N. CLINTON, CHICAGO, ILL.

welding controls. Of the synchronous type, and incorporating phase-shift type heat control, it starts and stops current flow at the zero point of the current wave, while current duration is adjustable to number of cycles desired.

Cabinet is the 4-panel type. Top panel is blank. Second panel is provided with three dials—to adjust current duration to number of cycles desired, to control the "cycles off" or "cool" time, to control the number of automatic repetitions of "heat" and "cool" cycles, up to a maximum of 15 pulsations. On the third panel is the selector dial for the phase-shift heat control. Back of lower panel provides a built-in tube contactor. Weltronic Corp., E. Outer Drive, Detroit.

Substitutes for Tin-Base Babbitts

Two lead base bearing metals, known as Pyramid and Defender, have recently been developed, as substitutes for tin-base babbitts. Pyramid metal is suited to applications where bearings must withstand heavy sustained pressures. Defender metal stands shocks without cracking and is suited for use in internal combustion engines, trap rock crushers, and sifter machinery. Magnolia Metal Co., 120 Bayway, Elizabeth, N. J.

Hard-Facing Rods

To serve companies unable to furnish high priority ratings, two hard-facing alloys, marketed as Stoodite K and Stoody Self-Hardening K, have been developed.

Stoodite K is a cast hard-facing rod consistitng principally of molybdenum, tungsten, manganese, silicon, carbon, and iron. It is supplied both in bare form for oxyacetylene application and in coated form for d.c. electric application. Available in five rod sizes: $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$, $\frac{7}{32}$, and $\frac{1}{4}$ inch, and in rod lengths of 14 inches. Forms smooth, dense deposits free from porosity and shrinkage cracks.

Stoody Self-Hardening K is composed principally of molybdenum, manganese, silicon, carbon, vanadium, and iron, and

The DISSTON CONSERVATION CONTROL PLAN

to save essential tools, time and materials MEETS WITH NATIONWIDE ACCEPTANCE

CONSERVATION CONTROL CARD No. 7

Flexible Back Metal Band Saws

How to obtain greater efficiency and make saws last longer.

FAILURE	CAUSE	CORRECTION
Stripping teeth	Tooth spacing too coarse.	Use recommended spacing.
	Starting cut at extremely thin section of material or on a corner.	Start cut where several teeth will contact material at same time.
Premature wear and loss of set	Speed too fast.	Reduce—see recommendations.
	Rubbing in guides.	Adjust so that teeth project beyond guides—also so that teeth project over edge of wheels.
	Riding on wheels.	
Breaking	Twisting in the cut.	If irregular cutting, use proper width saw for radius.
	Misalignment of guides.	Adjust so that top and bottom guides are in alignment.
	Guides set too far apart, allow band to twist.	Always adjust guides as close as possible to piece being cut.
	Insufficient tension.	Adjust tension to approximately 300 lbs. per inch of saw width.
	Allowing band to remain in tension when not in use.	Remove saw from machine or release tension. Where extreme differences of temperature occur, this practice will prevent breakage.
Cutting out of line	Misalignment of guides.	Adjustment should be made.
	Spacing of guides.	Set as close as possible.
	Set worn on one side due to contact with wheels or guides.	Adjust so that teeth project beyond guides—also so that teeth project over edge of wheels.
	Feed too heavy.	Reduce feed or use coarser tooth saw.

(CONTINUED ON OTHER SIDE)

Correct use of tools . . . makes work easier . . . saves vital materials

CONSERVATION ★ SERVES EVERYONE ★ HENRY DISSTON & SONS, INC. ESTABLISHED 1840 REG U.S PAT OFF

Throughout the nation, industries of practically every type are applying and endorsing the Disston Conservation Control Plan.

Hundreds of thousands of the Plan's Instruction Cards—covering 34 different kinds of cutting tools—have been distributed. These are the free cards containing information on the correct selection, adjustment, use and care of tools . . . to help save time, material and equipment, for maximum war production.

You can use Disston Conservation Control Cards in your plant to minimize tool breakage, reduce waste, simplify supervision, speed output and improve workmanship. Simply request the type and quantity of cards you require and they will be supplied without charge—whether or not you are a user of Disston products.

Disston Hard Edge, Flexible Back, Metal Cutting Band Saws for high speed precision work on ferrous and non-ferrous metals . . . they cut faster and cleaner.

Take this opportunity to cooperate in an important conservation program which has met with outstanding success throughout American industry. Write today for information and material to Henry Disston & Sons, Inc., 724 Tacony, Philadelphia, Pa., U. S. A.

INFORMATIVE BOOKLET FREE!

This booklet describes the Disston Conservation Control Plan and contains reproductions of Cards and other material . . . also an Order Blank for your convenience. Send for it today!

NO MEASURABLE WEAR

Reported by
PROMINENT
MANUFACTURER

THEIR PROBLEM

To increase life of gears and anti-friction bearings in high speed precision tools.

THEIR SOLUTION

Addition of "Oildag" (colloidal graphite in oil) to regular greases.

THEIR RESULT

(a) Reduced temperature rise from 60°F to 45°F
(b) Current input 14% less
(c) No measurable wear on gears after 1500 hrs., nor on bearings after 300 hrs.

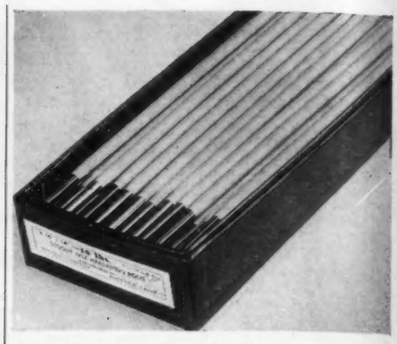
'Oildag' is a registered trademark of A. C. C.

Ask for complete report of test and Bulletin No. 92 E

ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN

The electric furnace graphite in "dag" products is manufactured in the U. S. A.

To Industry: "Dag" Colloidal Graphite is a lubricant – resists extreme temperatures and pressures – is electrically conductive, opaque and chemically inert – can be suspended in many liquids including the lighter viscosity fluids.



is made in the form of tubes with the mixed alloys on the inside. This rod is supplied bare for oxyacetylene application and bare and coated for d.c. electric application. Available in three rod sizes: $\frac{1}{8}$, $\frac{5}{16}$, $\frac{1}{4}$ inch. Electric rods are 14 inches in length, acetylene rods, 28 inches. Air Reduction Sales Co., 60 E. 42nd St., New York.

Industrial Gloves

Steel grip Triplex guard glove is designed for punch press work, buffing, grinding, sorting, assembly, inspection, for all jobs where protection is needed only on thumb and first two fingers. Available in wool felt, for handling greasy or oily parts, or

as protection against heat in the handling of hot dies, molds, parts, and in chrome leather. In both types back is made of elastic webbing which assures the wearer a cool, comfortable fit. Can be purchased as pairs, all rights, all lefts, or any combination of rights and lefts as needed. Industrial Glove Co., Danville, Ill.

Limit Switches

Class 9007 Type P small precision limit switches have been designed specifically for use where space and operating force are limited. Basic switch units (2 inches long by 1 inch square) are inclosed in transparent molded polystyrene cases, sealed against tampering, yet allowing visual inspection of contacts.

Fifteen-degree travel is sufficient to operate the switch, and the lever permits an additional 40-deg. emergency overtravel in either direction. A camera shutter type toggle mechanism gives accurate operation with 2½ ounces force applied to a 1-in. lever arm.

Die-cast inclosures for surface mounting

IF IT'S AN AIR FILTER PROBLEM AIR-MAZE ENGINEERS WILL SOLVE IT!

Our Specialized Experience of nearly 20 years is Yours—to help you make your Present Equipment last longer

● The photograph above shows only a few of the 3,000 different types and sizes of air filters which AIR-MAZE engineers have designed for almost every field of application.

This *specialized* engineering experience is a part of every air filter we produce. It is yours at no extra cost when you specify "AIR-MAZE."

Whether your air filter problems involve engines, compressors, blowers or air-conditioning, be sure to ask AIR-MAZE engineers *first*. Their experience can help you improve performance, lower maintenance costs and prolong the life of your vital equipment. Write for complete information.

AIR-MAZE CORPORATION • General Offices, Cleveland, Ohio

ONLY AIR-MAZE HAS THIS PATENTED FILTER MEDIA

Scientifically designed and precisely arranged "maze" of crimped round wire utilizes the "baffle-impingement" principle to the highest degree. Provides highest efficiency with extremely low pressure drop. Cleanable. All metal. Nothing to wear out.

AIR-MAZE

DEPENDABLE AIR FILTERS FOR EVERY APPLICATION

"I Do This Every Year!" Accident-conscious men of industry look anxiously to the hot months — months when men sweat most — when ever-lurking Heat-Fag takes its heavy toll. It is a fact that as the heat curve goes up, so does the accident rate. For, workers who sweat lose body salt. Unless it is replaced — fatigue sets in. Vitality is sapped — men become inalert . . . and that's when accidents happen . . . and when man-hours are lost. For, Heat-Fag and accidents ride together!

AVOID HEAT-FAG··USE
MORTON'S
SALT TABLETS

QUICK DISSOLVING
(less than 30 seconds)
This is how a Morton Salt Tablet looks when magnified. Examine one—see how soft and porous it is inside. When swallowed whole — with a drink of water, they dissolve in less than 30 seconds.

Wherever workers sweat, Salt Tablets are needed, for they represent the simple, easy way to replace salt that's lost through sweating and hot work.

Case of 9000 10-grain salt tablets, - - - - - - $2.60

Salt-Dextrose Tablets, case of 9000 - - - - - $3.15

Order from your distributor—or directly from this advertisement.

Place MORTON'S DISPENSERS at all Drinking Fountains
They deliver salt tablets, one at a time, quickly, cleanly — without waste. Sanitary, easily filled, durable. 500-tablet size, $3.25. 1000-tablet size $4.00

MORTON SALT CO., Chicago, Ill.

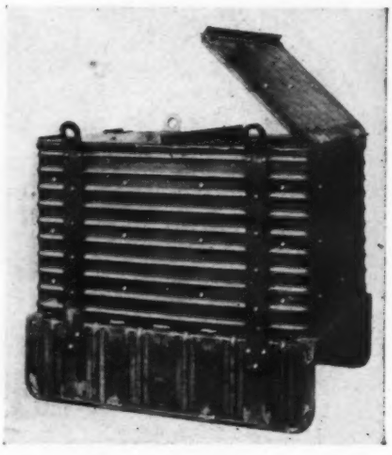
FREE Sample Tube Write—on your firm letterhead — for a pocket size sample tube of Morton's Salt Tablets and for the new folder — "Heat-Fag and Accidents Ride Together."

EVERYONE WHO SWEATS NEEDS SALT

types are 3⅞ inches long by 1 1/16 inches wide by 2 3/32 inches high. A flush type arrangement also is available. Either push rod or roller arm actuators are used. Inclosed type switches require only 5-deg. rotation for operation and provides for 25-deg. emergency overtravel in either direction. The return spring is readily shifted to reverse contact action or provide latch type operation. Snap-action silver contacts have both a.c. and d.c. electrical ratings. Normally open and normally closed circuits are insulated electrically to make a common connection unnecessary. Industrial Controller Div., Square D Co., 4041 North Richards St., Milwaukee.

Insulated Skid Box

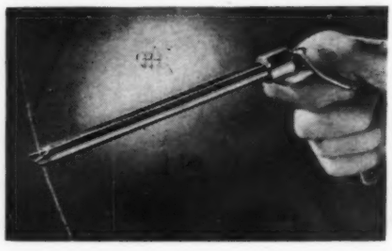
A skid box for storing and cooling hot forgings is a late engineering development. Unit has a 7-gage skid, 9-gage outer casing, and a 12-gage inner casing, with a ¾-in. asbestos lining in between. Lid also is



reinforced and insulated. Box is filled with hot forgings, picked up by a crane or lift truck, then stored out of the way until the forgings have completely cooled. Can be supplied in sizes to meet individual requirement. The Union Metal Mfg. Co., Canton, Ohio.

Cutter-Retriever

Designed to (1) cut wire with one handed one-fingered trigger operation, and (2) to retrieve or to hold in a powerful grip nuts, bolts, washers, cotter pins at inaccessible points, the Alpert long-nose cutter-retriever resembles a pistol, the cutting edges being located at the end of the long slim barrel. To cut wire, the operator merely places the wire between the cutting edges at the business-end of the pistol and snips off the wire by bringing down the trigger which actuates a rod operating inside the barrel of the pistol. The leverage ratio



"TWO lives?" "Sure...Research Leather Belting outlasts Rubber V-Belts on 'Production Drive' 2 to 1"

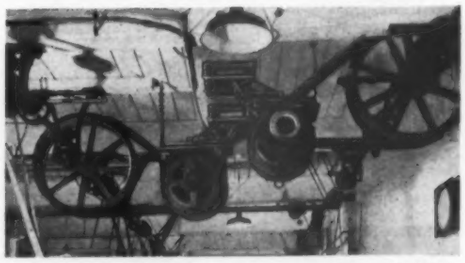
"How do you figure?"

"Look it up in *Fifty Reports on Mechanical Power Transmission from Motor Drive to Industry* by Robert Drake. Says a first-quality leather belt on pivoted motor drive outlasts a rubber V-belt *two or more* times!"

"But why *Research* Leather Belting?"

"Because it hugs pulleys without slip. Because excessive stretch has been removed in manufacturing. Because it rides small pulleys with minimum flexing wear.

Result: less tension, less maintenance, longer life."



Research Leather Belting on Pivoted Motor Base Drive (Production Drive)

GRATON & KNIGHT CO. Worcester, Massachusetts

Only leather belting manufacturer with complete nationwide service facilities. Distributors listed on Graton & Knight page in THOMAS' REGISTER

WE HAVE BEEN DOING THIS TOO LONG

We have been hiding a light (figurative, of course) under a bushel. We mean the untiring, behind-the-scenes work of our research and design staffs who are working today on the problems of *tomorrow's* lighting. When new light sources are developed, Silv-A-King equipment will be ready to put them to the most effective use. For 21 years this policy of *looking ahead* has been a major factor in establishing Silv-A-King's reputation as lighting specialists throughout industry. Bright Light Reflector Co., Inc., 1027 Metropolitan Ave., Brooklyn, N.Y.

Write for one or both of these Silv-A-King Lighting Guides: LG1 — Fluorescent, or LG2 — Incandescent.

A Few Typical Silv-A-King Users:

AC SPARK PLUG
GENERAL MOTORS
FISHER BODY
INTERNATIONAL HARVESTER
JONES & LAUGHLIN STEEL
PITTSBURGH PLATE GLASS
and many others

SILV-A-KING MAKES *Light* WORK FOR YOU

is 15 to 1, hence practically no thumb pressure is required on the trigger.

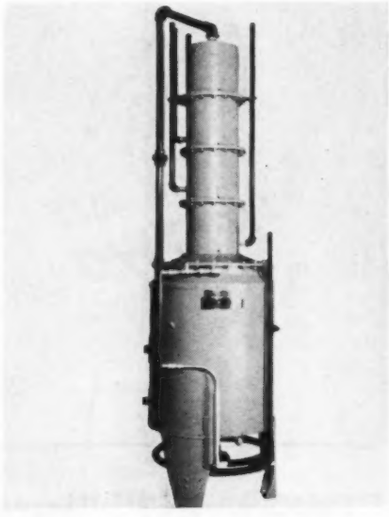
To retrieve a bolt, nut, washer, cotter pin that may have dropped into an inaccessible place, the long-nose barrel is poked into the hard-to-get-at place, the trigger brought downward, and the hardened steel cutters pick up the missing part. Pack-Rite Machine Corp., 828 N. Broadway, Milwaukee.

Plastic Fittings

Fittings molded from thermoplastic known as Saran are now available for tubing sizes $\frac{1}{4}$ to $\frac{3}{8}$ inches o.d. Fittings are claimed to have a high tensile and bursting strength, to be non-corroding and non-aging, and being also non-conductors of electricity, to be able to prevent formation of galvanic couples. Acadia Synthetic Products Div., Western Felt Works, 4115 Ogden Ave., Chicago.

Air Conditioner

Cold room air conditioners providing constant temperature as low as —50 to —80 degrees Fahrenheit are available. No-Frost Method provides equipment for maintaining low temperatures—and also for introducing fresh make-up air at correct low



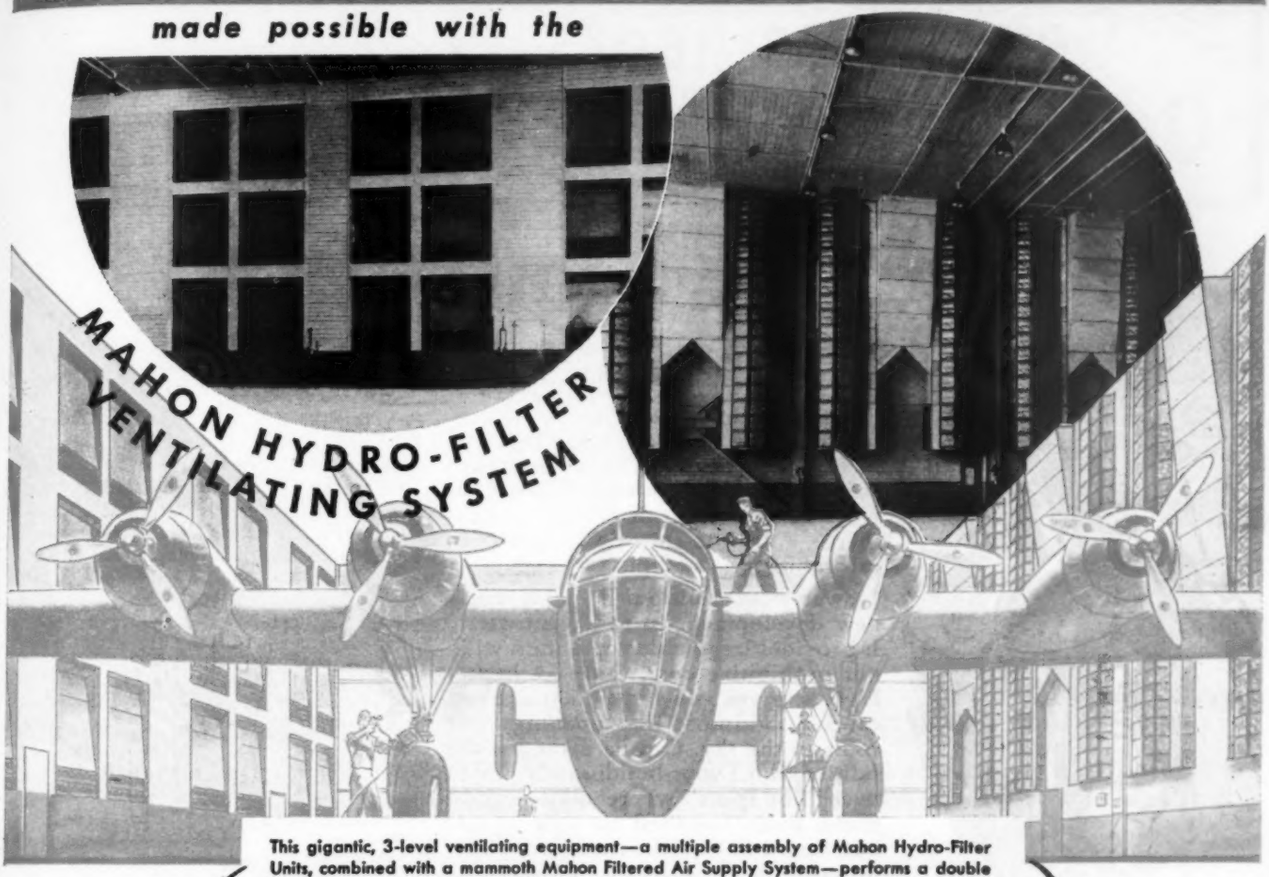
temperatures. It is claimed that this equipment, using Niagara No Frost Liquid (no brine) gives constant operation without interruption or loss of capacity because of ice or frost forming on cooler or corrosion of the equipment from contact with brine or calcium. Niagara Blower Co., 6 E. 45th St., New York.

Holding Magnet

In welding, when plates are drawn together, often one is higher than the other. By use of holding magnets the plates are drawn to a level alignment. Magnets are available in various sizes, and are operable from 40 to 60 volts d.c. Terminal for energizing cable is protected from shock and damage. Stearns Magnetic Mfg. Co., Milwaukee.

A Spectacular Advancement IN AIRCRAFT PAINTING

made possible with the



This gigantic, 3-level ventilating equipment—a multiple assembly of Mahon Hydro-Filter Units, combined with a mammoth Mahon Filtered Air Supply System—performs a double function. It clears the room, at three separate levels, of dangerous overspray and fumes and continuously floods the entire space with washed and filtered air, maintaining an equalized air flow throughout the room. Enclosure is 150′ wide, 100′ long, 35′ high, the largest spray booth and ventilating system ever designed and installed, so far as is known.

SPRAY PAINTED *after* COMPLETE ASSEMBLY

One of the problems encountered by the aircraft industry in meeting the seemingly impossible demands of modern war production was the painting—*after complete assembly*—of an entire airplane. Such an undertaking necessitated not only a spray painting enclosure of immense proportions but a satisfactory means of exhausting the paint-laden air from the enclosure and replacing it with washed and filtered air to insure operator protection and adequate safety precautions against fire and explosion. The problem was put up to Mahon engineers for solution. They succeeded in solving it by designing the ventilating system, described and pictured above. It offers compelling evidence of the ability of the Mahon organization to participate in the working out of ANY spray painting project—big or little—in the aircraft industry—or elsewhere.

For the interesting details of this achievement, write

THE R. C. MAHON COMPANY • DETROIT • CHICAGO

Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Units, Hydro-Foam Dust Collectors—and many Other Units of Special Production Equipment—including Complete Finishing Systems.

MAHON

For More Production and Better Worker Morale

Get excess heat Out of your buildings

with

Swartwout Multiple* Heat Valve

CUT time losses, reduce spoilage and increase production with better ventilation. *Heat kills efficiency.* When your workers suffer from excessive heat there's a definite slow-down and critical war materials output suffers.

Swartwout Multiple Heat Valve is a new development in roof ventilation. It provides large scale ventilation without prohibitive cost. Only 32 inches high, it gives you large heat exhaust capacity — almost like opening your roofs to the sky. Can be extended the full length of your buildings or placed over "hot spots" where need is most acute. Easily installed on new or old building. • For quick relief from costly excessive heat, write for information on the Swartwout Multiple Heat Valve.

THE SWARTWOUT CO. • 18509 Euclid Ave., Cleveland, O.

Also Makers of SWARTWOUT ROTARY VENTILATORS
SWARTWOUT-DEXTER HEAT VALVE
SWARTWOUT AIRJECTOR

"Like Opening Your Roofs To The Sky"

Swartwout

VENTILATION SPECIALISTS

Also Swartwout Power Plant Equipment

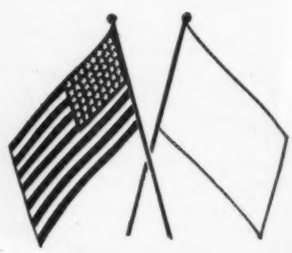
Flag Rules

WHEN THE FLAG is being raised or lowered or when it passes in a parade, a man removes his hat with his right hand and places it over his heart while standing at attention. A woman, or a hatless man, places the right hand over the heart.

Whenever the Star Spangled Banner is played, a civilian stands and faces the music, with right hand over heart, except when the Flag is being lowered at sunset, on which occasion he faces the Flag and salutes as described above. The salute is held until the last note of the anthem.

1. The Flag should be displayed from sunrise to sunset. It should be hoisted briskly, but lowered slowly and ceremoniously. The Flag should now be displayed every day.

2. When carried in a procession with other flag or flags, the American Flag should be either on the marching right—i.e., the Flag's own right—or when there is a line of other flags, in front of the center of that line.



3. When displayed with another flag against a wall from crossed staffs, the Flag

How NOT to drag hose. Avoid pulling kinks in hose. Take time to LIFT and pull over rough places.
How NOT to use hose. Do not shut off hose this way; it will speed breakdown, slow-up production.

War on *Wear!*

MANHATTAN'S Suggestions for the Care of RUBBER HOSE

You can make your rubber hose last longer if you follow these 12 Rules carefully. This is patriotism and efficiency.

1. Avoid sharp bends at fittings; also twists and kinks in body of hose.
2. Attach couplings carefully, forcing shank straight into hose, using soap and water lubricant.
3. Straighten hose before dragging and while unpacking. Do not forcefully bend, twist, kink, or pull hose.
4. Do not stop flow by kinking (see illustration); this ruptures fabric reinforcement.
5. Do not let hose lie in sun, hot or damp places.
6. When not in use, drain and roll up, but do not suspend on nail.
7. Do not permit heavy objects to run over hose.
8. Avoid excessive temperatures, violent fluctuations of pressure, unnecessary flexing, oil or grease.
9. Rotate large hose periodically to distribute wear and handle with ample supports to distribute strains.
10. Use the correct type and size hose for the conditions.
11. Store in dark, cool place.
12. Consult MANHATTAN Representative.

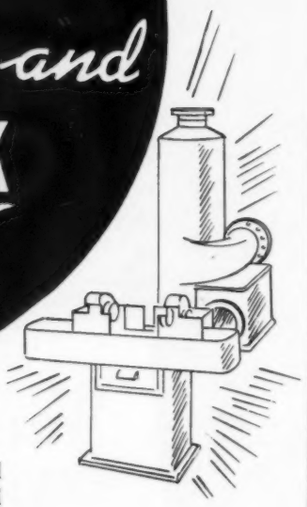
The qualities that result in long life have been a MANHATTAN objective for 50 years in the "engineering" of its rubber products for industry.

KEEP AHEAD WITH MANHATTAN

This is No. 2 of a series on rubber conservation. Reprints are available in card form, punched for hanging.—Write for them.

THE MANHATTAN RUBBER MANUFACTURING DIVISION
of RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES
PASSAIC, NEW JERSEY

To MANUFACTURERS who SUB-CONTRACT SHEET STEEL and PLATE WORK



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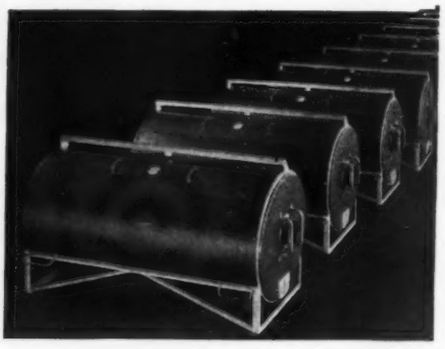
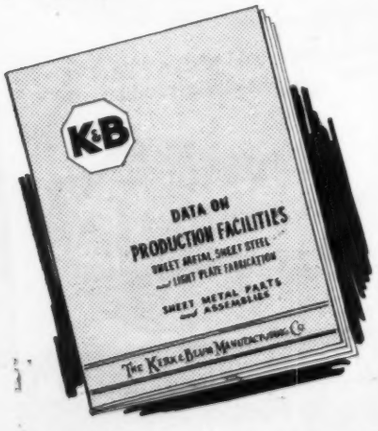
offers the facilities of a modern plan equipped with efficient labor-saving machinery and manned by a corps of highly skilled craftsmen. Sheet metal parts can be fabricated to meet your most exacting requirements.



Delivery schedules can be advanced and a savings in time and money effected because Kirk & Blum, with its background of more than a third of a century of specialized experience, makes full use of efficient, speedy production methods to insure prompt deliveries.

Manufacturers find the use of Kirk & Blum service and facilities pays dividends. It's a solution to their problems.

Avail yourself of these advantages today. Send us your blue prints for prompt quotations.



We fabricate Stainless (all types) Aluminum, Monel, Brass, Copper, Angle and Bar Shapes.

"Data On Production Facilities," a new Catalog, will be mailed on request.

Accurate Sheet Steel Fabrication Capacity $\frac{3}{8}$ inch and lighter.

Organization of Engineers and Mechanics.

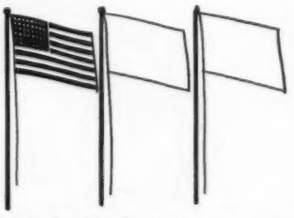
The **KIRK & BLUM** *Manufacturing Co.*

2835 Spring Grove Ave. Cincinnati, Ohio

of the United States should be on the right, the Flag's own right (the observer's left), and its staff should be in front of the other staff.

4. When a number of flags of States or cities or pennants of societies are grouped and displayed from staffs with the Flag of the United States of America, the latter should be at the center or at the highest point of the group.

5. When flags of states or cities or pennants of societies are flown on the same halyard with the Flag of the United States of America, the latter should always be at the peak, except for the official church flag. When flown from adjacent masts, the Flag of the United States of America should be hoisted first and lowered last, and should be at the right of the line (observer's left), and should be as high or higher than any other.



6. When flags of two or more nations are displayed, they should be flown from separate masts at the same height and the flags should be of approximately equal size.

7. When the Flag is displayed from a staff projecting horizontally or at an angle from

FIRE AND HOW TO FIGHT IT!

WHEELED FIRE-FIGHTERS

Easy portability combines with big fire-fighting capacity in the heavy-duty Kidde Wheeled Units. With carbon dioxide capacities of 50, 75 and 100 lbs., these big extinguishers handle fires too tough for hand-models. Each Kidde Wheeled Unit is equipped with a long hose and has a specially designed nozzle for prompt fire-control. Located at the grip is a valve handle which enables the fire fighter to control the discharge as he attacks the blaze.

Kidde Wheeled Units are widely used to protect outdoor hazards and to guard large machinery, difficult processes.

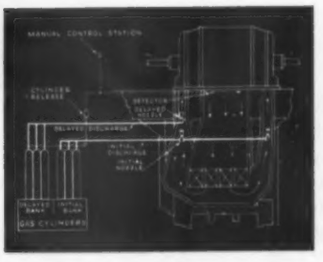
PULL THE TRIGGER—*KILL THE FIRE!*

Here it is! . . . the fastest-action, easiest-to-operate fire-killer you ever saw!

There's a pistol grip for one-handed action and for quick maneuverability. There's a trigger-control for fast, easy discharge. A finger's touch discharges the unit. Only Kidde has these sensible, simple features.

You can get Kidde trigger-control extinguishers with 2 or 4 lbs. of carbon dioxide capacity. Use them against flammable liquid or electrical fires. Hang Kidde units in laboratories and garages, near work benches and on your trucks. When fire strikes, Kidde snuffs it out fast in a flurry of carbon dioxide snow-and-gas. Just *aim . . . shoot . . . kill the blaze!*

Think this over: Newly-hired workers may not know how to handle some industrial-type extinguishers in emergency. *But anyone knows how to pull a trigger!*



GUARD ELECTRICAL MACHINERY

Do you know about *built-in* protection of electrical equipment? Do you know how to kill fire *automatically* in generators and other rotating machines? You can handle this job with Kidde Built-in Systems.

For control rooms, transformer vaults, get a total-flooding Kidde installation. Kidde carbon dioxide snow-and-gas is safe, even on "live" equipment. Too, Kidde confines damage to that done by fire itself. Underwriters give full approval to Kidde portables and Kidde Systems for use against electrical fires.

Kidde SNUFFS OUT FIRE

Kidde

Walter Kidde & Company
Incorporated
712 West St., Bloomfield, N. J.

"NO SMOKING" MEANS *NO SMOKING*

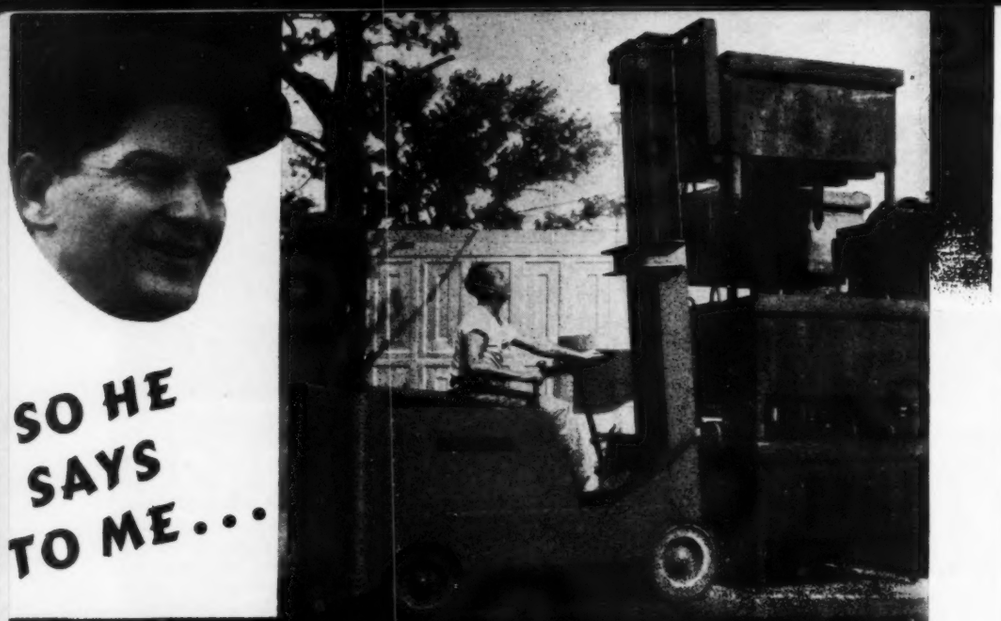
Courts are handing out stiff fines and jail sentences to workers who violate smoking rules in defense plants. Unions are cooperating, too. National Fire Protection Ass'n warns that restrictions should at all times be *reasonable*. Often safe areas may be designated as O.K. for smoking. Best rule is—insist on strict observance whenever safety is threatened.

RED MEANS DANGER

When fire breaks out, extinguishers must be ready for action. Built-in electrically operated Kidde Systems may be equipped with tell-tale panel to indicate if unit has been discharged or maliciously disabled. Panel has one green, one red light. *Green* light shows Kidde System "ready and waiting". *Red* means System has been released, must be recharged.

DO YOU LIKE STATISTICS?

N.F.P.A. reports fire loss for last 25 years totals *over $10 billion*. 1941 total is an estimated 5% increase over 1940. Ten-year trends are much more encouraging. In the period 1922-31 annual *average* loss was $506 million! During last 10 years we cut these figures to annual average of $284 million. *This wasted money buys 1100 medium bombers!*



SO HE SAYS TO ME...

You Take the High Load and I'll Take the Low Load!'...

"Do I get sore? Not me, mister. High load, low load . . . what's the difference when I'm wheeling a Towmotor around? With that high-powered baby I can take any load anywhere, and spot it on a dime before a 'muscle man' is halfway through his grunting.

"Maybe you think that doesn't make a difference in the amount of work I turn out. I put in eight hours, see . . . and my Towmotor is humping every minute of the day. Unloading incoming materials . . . moving them into storage . . . spotting parts in process from machine to machine to keep production humming . . . loading finished goods for shipment . . . well, there's practically no limit to the number of jobs I can do.

"Sure it keeps me busy. But not back-breaking-busy, 'cause I do the thinking while Towmotor does the lifting and moving. It's a break for me, and it's a big break for the boss, too. If *you're* a boss and are wondering how to get more work from fewer men, keep production moving from start to finish, take a tip from a guy on the firing line: get the facts about Towmotor."

Towmotor CAN DO A JOB FOR YOU

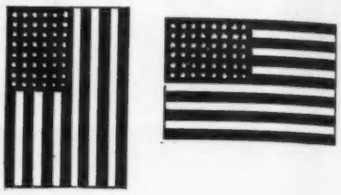
Adaptable to almost any handling operation. Picks up 1,000 to 10,000-pound loads as units, moves them as fast as 10 miles per hour, stacks to 25 feet, works 24 hours a day for less cost than 24 man hours. Ask Towmotor engineers to survey materials movement in *your* plant.

TOWMOTOR COMPANY
1270 East 152nd St. Cleveland, Ohio

TOWMOTOR CLEVELAND

THE 24-HOUR ONE MAN GANG

the window sill, balcony, or front of building, the union of the Flag should go clear to the peak unless the Flag is at half-mast.



8. When the Flag is displayed in a manner other than by being flown from a mast, it should be displayed flat, whether indoors or out. When displayed either horizontally or vertically against a wall, the union should be uppermost or to the Flag's own right, i.e., to the observer's left. In a window it should be displayed with the union or blue field to the left of the observer in the street. When festoons, rosettes, or drapings are desired, bunting of blue, white, and red should be used, but never the Flag.

9. When displayed over the middle of the street, the Flag should be suspended vertically with the union to the north in an east-and-west street or to the east in a north-and-south street.

10. On a speaker's platform, the Flag, if displayed flat, should be above and behind the speaker. If flown from a staff it should be in the position of honor, at the speaker's right. It should never cover the speaker's desk or drape over the front of the platform, but bunting may be used for this purpose, if desired, with the blue uppermost.

11. When used in unveiling a statue or monument, the Flag should not be allowed to fall to the ground, but should be carried aloft to wave out, forming a distinctive

THE *Gilmer* NATIONAL POWER-RECOVERY PLAN

WAR PRODUCTION BOARD
WASHINGTON, D. C.

IN REPLY REFER TO:
154

April 23, 1942

AIR MAIL - SPECIAL DELIVERY

Mr. John S. Krauss, President
L. H. Gilmer Company
Tacony
Philadelphia, Pennsylvania

Dear Mr. Krauss:

After reviewing the essential elements of the proposed GILMER PLAN and considering the contribution it should make in the conservation of certain critical materials, and also in the important matter of conserving industrial power, we can advise that the Plan is in keeping with the general aims and objectives of the Industrial Salvage Section of the War Production Board, and we are glad to express our appreciation of your efforts in this direction.

The job of conservation and salvage of materials, machinery and supplies, along with the prevention of power losses, is one of the most important facing American industry today.

Very truly yours,

George T. Weymouth

George T. Weymouth, Chief
Industrial Salvage Section
Bureau of Industrial Conservation

COVERS—

ELECTRICITY
STEAM
WATER
MECHANICAL POWER
REFRIGERATION
COMPRESSED AIR
BOILER ROOM
PRIME MOVERS

"It's OK, *Gilmer*!"

says WPB

USE WHAT YOU LOSE

INDUSTRY'S vastly accelerated pace is turning power into Strategic Material No. 1. For the success of the war effort, Industry must salvage its tremendous power-wastes, and *use* that power for war production!

To help accomplish this urgent task, Gilmer, in collaboration with leading power engineers, has developed the National Power-Recovery Plan. This Plan is practical and workable, pointing out plainly just *where* and *how* power can be saved with a minimum of time and effort.

Authorities on power estimate that, if the Plan is adopted by America's industrial plants, the resultant power-saving will equal the combined output of two Boulder Dams! Translate that power in terms of *more* warplanes and tanks!

Here's the long-awaited chance to get an official "Go-Ahead" in your battle against power-waste! Show this advertisement to the responsible executive in your plant and get his support. Then put the Power-Recovery Plan to work! It comes completely packaged in a special Booklet. Write to Gilmer for a copy.

L. H. GILMER COMPANY, Tacony, Philadelphia, Pa.

The oldest firm of rubber fabric belt specialists

Need plant offices IN A HURRY?

Build them with TRANSITE WALLS

There's no reason why plant office expansion should interfere with production—not when you build with Transite Walls. For these modern movable partitions go up fast—*in many cases complete new offices can be constructed overnight*. And their asbestos-cement composition provides durability and fire-safety with the assurance of continued low maintenance. Check these important features:

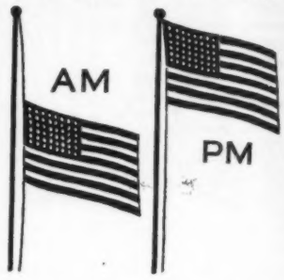
1. **QUICKLY INSTALLED** — Transite Walls are installed dry, without dirt or disturbance. The use of large pre-fabricated units cuts construction time to a minimum.
2. **EASILY RELOCATED** — Whenever changes are necessary, Transite Walls can be easily re-located—moved from one building to another if necessary—with complete salvage of materials.
3. **RELEASE CRITICAL MATERIALS FOR WAR USE**—because Transite Walls are composed basically of asbestos-cement sheets.
4. **FORM ANY TYPE PARTITION**—free-standing, ceiling-high, solid or in combination with glass.

For complete details on Transite Walls, write for brochure TR-22A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville
TRANSITE MOVABLE ASBESTOS WALLS

feature during the rest of the ceremony. No object may be placed on the Flag except the Holy Bible.

MEMORIAL DAY



12. When flown at half-mast, to indicate mourning, the Flag should be hoisted to the peak for an instant and then lowered to the half-mast position; but before lowering the Flag for the day it should be raised again to the peak. Half-mast is one-half the distance between the top and bottom of a mast, the Flag's own width below the peak on a pole or staff.

13. When the Flag is displayed on a small staff, as when carried in a parade, mourning is indicated by attaching two streamers of black crepe to the spearhead, allowing the streamers to fall naturally. Crepe is used on a flagstaff only by order of the President.

14. When used to cover a casket, the Flag should be placed so that the union is at the head and over the left shoulder. The Flag should not be lowered into the grave nor allowed to touch the ground. The casket should be carried foot first.

15. When the Flag is displayed in the body of the church, it should be from a staff placed in the position of honor at the congregation's right as they face the clergyman. The service flag, the state flag, or other flag should be at the left of the congregation. If in the chancel or on the platform the Flag of the United States of America should be placed at the clergyman's right as he faces the congregation and the other flags at his left.

16. When the Flag is in such a condition that it is no longer a fitting emblem for display, it should not be cast aside or used in any way that might be viewed as disrespectful to the national colors, but should be destroyed as a whole privately, preferably by burning or by some other method in harmony with the reverence and respect we owe to the emblem representing our country.

All-Out
WAR PRODUCTION
DEMANDS DAYLIGHT
for the
"GRAVEYARD SHIFT"
NAME OF MANUFACTURER
RLM
LABORATORIES
RLM Silvered Bowl Diffuser
RLM Symmetrical Angle Reflector
RLM Deep Bowl Reflector
RLM Dome Reflector
When Lighting Your Plant for Efficient Multiple-Shift Operation, Insist on Lighting Units Bearing this Label.
• The multiple-shift day—vital to our war effort—is putting an increasing number of workers under the dual pressure of high-speed effort and unnatural working conditions.
To meet these conditions—particularly on the "graveyard" shift, when human vitality lags—there can be no compromise on *quantity* or *quality* of lighting. When workers see easily, fatigue is delayed. This often means 5 per cent more output . . . corresponding reductions in errors and accidents.
Adequate lighting—directed for maximum efficiency and energy conservation—depends to a large degree upon the basic design and construction of the lighting equipment. When you purchase lighting units bearing the RLM LABEL you know that exacting laboratory and engineering tests have proved them highly efficient, economical to maintain at their original lighting efficiency, able to withstand vibration and heavy duty service, and uniform in quality.
Only Industrial Lighting Units built to exacting RLM Specifications and certified by Electrical Testing Laboratories are permitted to carry the RLM LABEL. Write for booklet, "The Meaning of the RLM LABEL".
The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers
RLM STANDARDS INSTITUTE
INCORPORATED
307 N. MICHIGAN AVE. SUITE 1600 CHICAGO, ILL.

IS *Half* A BLINDFOLD SLOWING YOUR PRODUCTION?

ALL stockrooms have *some* kind of lighting, but the efficient ones have *correctly designed* illumination to speed up the handling of war orders . . . to prevent costly mistakes . . . to avoid delays.

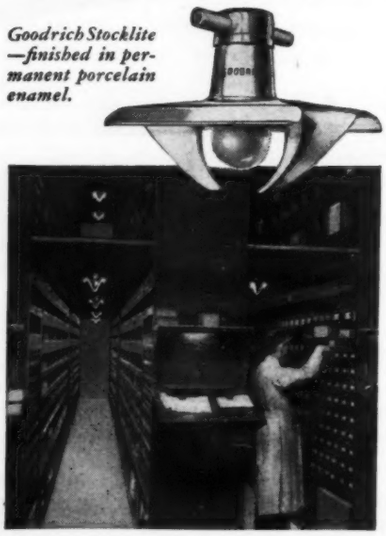
Created expressly for this purpose, the Goodrich Stocklite provides the exact pattern of light you need in stockroom aisles. It illuminates shelves uniformly from top to bottom row—delivers maximum intensities in bin interiors. Yet, there is complete absence of glare in the aisles because all the light is directed where it's needed, without waste. When stock clerks can see better, they work faster, more efficiently!

Typical of many outstanding Goodrich developments in industrial lighting, the Stocklite is used in hundreds of war plants and Government Departments. Ask for Bulletin No. 91.

RLM

Protecting vital plants with floodlighting—saving man-hours in production—Goodrich Industrial Fixtures are serving America's war effort everywhere.

Goodrich Stocklite—finished in permanent porcelain enamel.



SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4604 BELLE PLAINE AVENUE, CHICAGO, ILL.

Load Charts Show Up Production Bottlenecks

(Continued from page 76)

by the number of machines involved in each group.

3. Because an estimate was being used, we could not figure 100 percent of capacity. A certain percentage had to be allowed for errors in estimating, defective castings, and so on. The percentage varied according to the class of work and the type of machines involved.

The accumulative load and actual production lines on the load charts were the same as the others, except that with the machine shop the lines represented hours, whereas in the other departments they represented jobs, molds, or templets. Here the production line gave us additional information. It told how far off the estimator was, because actual hours to perform the job were posted instead of estimated hours.

Forestalling Complaints

If it were necessary for the schedule clerks to page through the load charts to find what days were open, probably too many complaints would be made that using load charts is too complicated and slows up work too much.

Anticipating these complaints, a simple form (Figure 2) was devised which makes the use of load charts easy. First thing each morning the man in charge of the charts fills out this form, and puts down the first open date for each department. For the average job this chart gives the schedule clerks all the information they need. It tells them not to schedule any work ahead of the dates on the form unless it is absolutely necessary. However, if the schedule clerk has a job that will require considerable time, he is urged to use the load chart to be sure there is sufficient open time to cover the entire job in the dates he has selected.

Posted Each Week

Once each week the amount of work scheduled ahead of each department is posted in graph form (Figure 3) so that a comparative picture of the amount of work of all departments can be seen at a glance. To get the data for this graph it is necessary only to add the number of days between the end of the actual production line and the end of the accumulative load line. It can be seen at a glance if any

IT CAN'T HAPPEN HERE

New window panes of reinforced Vuelite can end the danger of flying glass

WHEN air raid sirens screamed in England, work stopped at machines set near windows . . . for concussion from even a distant bomb would fill the air with deadly slivers of flying glass.

To end that menace here and keep vital machines at peak production even under the threat of enemy bombs, Monsanto in collaboration with the United States Navy has developed this window pane of standard, sixteen-mesh wire screening laminated with Vuelite, the transparent cellulose acetate widely used for lighting fixtures.

Unlike the types of plastic-coated cloth and wire previously used to replace "bombed out" glass in England, the new reinforced Vuelite is as clear and transparent as a screened window of glass and it can be easily installed in any conventional, multi-paned steel or wood sash.

Most important of all, however, it is tough and strong enough to withstand the blast of a 150-pound bomb exploded just eight feet away!

Tested under vacuum shock conditions, it stood up without appreciable damage under a 28-inch vacuum, while clear glass shattered at 15 inches and heavy, wire-reinforced glass at 26. In further tests at the Navy's Bureau of Yards and Docks, a quarter-pound ball dropped from a height of 20 inches smashed ordinary glass while it took a two-pound ball from a height of 42 inches to penetrate a pane of reinforced Vuelite. Even then, the missile left a clean-cut hole which could be repaired with cellulose tape with very little loss in breakage resistance over a solid piece.

Reinforced Vuelite will be supplied in drawn panels .03″ thick in sizes to fit standard multi-paned sash, with a quarter-inch flange for fastening to the window frame, but it can also be drawn or formed to special shapes.

Already being purchased by the Navy for use in war areas, reinforced Vuelite should prove highly useful in troop barracks, air fields, and vital industrial plants in potential air-raid zones and in certain types of military equipment. MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield, Massachusetts.

MONSANTO PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

The Family of Six Monsanto Plastics

(Trade names designate Monsanto's exclusive formulations of these basic plastic materials)

LUSTRON (polystyrene) • **OPALON** (cast phenolic resin)
FIBESTOS (cellulose acetate) • **NITRON** (cellulose nitrate)
SAFLEX (vinyl acetal) • **RESINOX** (phenolic compounds)

Sheets • Rods • Tubes • Molding Compounds • Castings
Vuepak Rigid Transparent Packaging Materials

ARMATURES, for example, -faster DRYING can speed up production
EASY TO ERECT WITH THAT PANEL CONSTRUCTION
Wherever increased output and improved quality of product must be secured—Ross Baking and Drying Equipment offers real opportunities. The Ross Compartment Oven with monorail loading for Armature Cores shown below is one example of how manufacturers of defense products are speeding up production. Increased capacity from faster, more uniform drying is achieved without adding oven units and floor space. Maximum efficiency and economy.
THE METHOD OF HEATING IS SO ECONOMICAL
AIR FOR YOUR PROCESS
0° TO 1000°
ROSS INDUSTRIAL OVENS AND DRYERS
Write For Our Bulletin No. 130
UNIFORM TEMPERATURES UNIFORM PRODUCT!
J. O. ROSS ENGINEERING CORPORATION
Main Office — 350 MADISON AVE., New York, N. Y.
ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

department is out of balance, and steps can be taken promptly to remedy the situation.

A sample of a graph form prepared after drawing off the load in the machine shop is shown in Figure 4. This form was prepared to show the picture of all the machines in the shop in relation to the accumulated load against them. All this information appears on each individual load chart. However, by plotting them all on one chart, a picture of all the machines can be seen at a glance. This picture brings out the fact that some machines have considerable loads, whereas others have a small load against them. The thought immediately arises, could some of the works on the heavily loaded machines be transferred to the others? Or, perhaps something could be done to speed up these heavily loaded machines. This is just another example of the type of story load charts can tell.

Not a Difficult Task

It is not necessary to delegate the job of keeping load charts to a graduate engineer. The work is simple and can be entrusted to anyone with a high school education, provided he is given a clear picture of what load charts are for, and how important it is to keep them accurate. He should bring any irregularities or discrepancies to the attention of his department head for prompt action.

In this article some of the many advantages that can be gained by the use of load charts have been listed. Their disadvantages are few. If they are used properly, the many advantages will easily offset all the possible disadvantages.

Significant Labor Developments

(*Continued from page 83*)

motivated by a desire to escape the penalties of the Act rather than by sympathy with the Act's purposes.

The Court noted that prior to the issuance of the injunction the employer's attitude was one of "bored acquiescence rather than active cooperation." (Snyder vs. Jacobs.)

Burden Not Employees' to Show Amount of Interstate Work

A Federal District Court ruled that employees engaged in both intra- and interstate work need not show how much time was spent in each in order to recover under the Wage-Hour Law,

If your coil department has its hands full...

Anaconda Can Help!...

Anaconda's Central West plants still have unfilled capacity on magnet wire and coil production... *for war work.* In addition to these facilities, they have experienced personnel to help solve problems you might have with this phase of manufacture.

Here is an opportunity to release your time so that it can be devoted to other important problems. Our sales offices, located in all principal cities, are near you. Call today. A representative will be glad to discuss your problem.

GENERAL OFFICES: 25 Broadway, New York City
CHICAGO OFFICE: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company
Sales Offices in Principal Cities

ANACONDA
from mine to consumer
This familiar trade-mark symbolizes the best efforts of modern research and production.

These Improved Insulations Are Now Available
Nylon—Vitrotex—and Formvar

The commercial development of Nylon and Vitrotex insulations is in part the result of Anaconda research . . . research that continues with redoubled effort producing new products for war work. Of course, when peace comes, the benefits of this research will be ready for industry everywhere.

42264

Magnet wire and coils

ANACONDA WIRE & CABLE COMPANY

VICTORY DEFENSE Bonds

Keep 'Em Rolling FASTER!... SMOOTHER!

A *built-for-the-job* industrial caster for every industrial purpose. Write today for the free Bond Data Book.

BOND 36-A CASTER (above)—Basically different in design, this caster combines easy swiveling with long service. The "reason why" lies in the arrangement of its ball races and its use of durable Bond Caster metal. Pressure lubricated throughout.

BOND 40-A CASTER (right)—The preferred light-weight caster for heavy duty. Sturdy, all steel construction reduces caster breakage...cracking... or excessive wear even under peak loads. Swivels with frictionless ease. Pressure lubricated throughout.

BOND Lift Jacks Keep 'Em Moving!

Built-for-the-job and built for easy, speedy operation. Send for your free bulletin today.

Bond REG. U.S. PAT. OFF. TRUCK CASTERS LIFT JACKS

BOND FOUNDRY & MACHINE CO., MANHEIM, PA.

since there is no practicable way to separate the employees' work. (Camfield vs. West Texas Utility Company.)

WAR LABOR BOARD

* *WLB Orders Wage Equalization*

Assuming full control for enforcing the President's anti-inflation policy as it affects labor disputes, the War Labor Board ruled that employees who receive more than a standard rate, which may usually mean the existing rate, are not entitled to wage increases (that is, rates at a given plant should be equalized with those at other plants of the kind in the locality) and that the pay of women should be equal to that of men when both do the same work.

* *WLB Orders Preferential Shop*

The War Labor Board ordered parties to a dispute to sign a preferential-shop contract. Members are to be given preference in employment, and the union is granted an opportunity to name new employees. The employer, however, is permitted to choose at his discretion from among employees in other divisions of the enterprise, provided the persons transferred are or become members of the union. (United States Lines Company.)

In another ruling, the Board read into a contract a preferential hiring clause but did not relax the customary requirement of preferring union members in filling vacancies. As far as the engagement of new members is concerned, the ruling practically borders on closed shop control.

Union members must be hired if available, but, if they are not, other persons may be hired and may within 30 days make application for union membership. But if during such 30-day period satisfactory union members are available, the employer must then discharge newly hired non-union men and fill their places with the union members. (Hotel Employers' Association.)

* *WLB Supports NLRB*

Employees, not management, are to decide who the union's business agent is to be, as well as the scope of its authority. Management's refusal to deal with a representative who, it charges, was not one of the employees, but one who had illegally seized control of the union, went unheeded by the War Labor Board. The Board indicated that it is not out of sympathy

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

4 SIMPLE STEPS to Save

*Months of Time and *Tons of Vital Materials

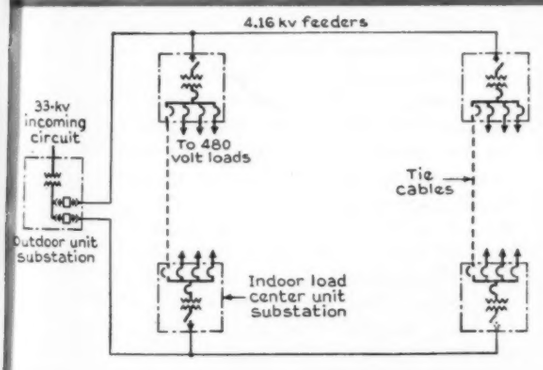
—in Getting Electric Power to New Production Machinery

1. Decide on a modern load-center distribution system using load-center unit substations.

2. Make a simple, one-line electrical layout of your proposed plant.

3. Specify standard equipment; standardization means you get better equipment more quickly and at lower cost.

4. Order your electric equipment as soon as possible so that it will be available for immediate installation when construction has progressed far enough.



A typical one-line diagram of a load-center distribution system, with power being distributed at high voltage (2.4 to 13.2 kv) to unit substations located near the centers of electrical load areas—eliminating long, heavy, low-voltage feeders from a distant large substation. Thus, you save tons of copper, and the performance of motors, lamps, etc., is improved because of the reduction in voltage drop.

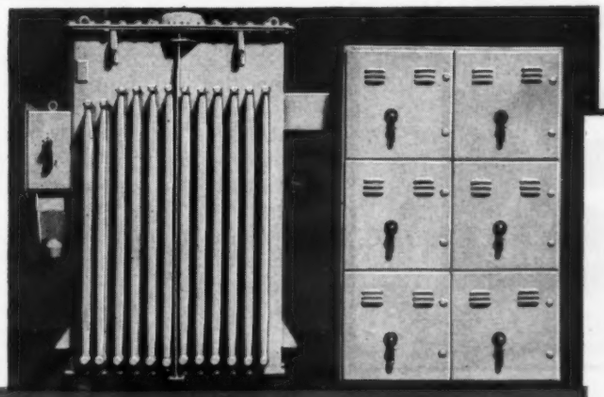
BY following these steps in General Electric's plan to provide standard load-center distribution equipment in the shortest time possible, you can save from *one to six months* of the time ordinarily required. You eliminate hours and hours at the drawing board, and long, drawn-out correspondence.

What's more, load-center distribution saves tons of steel, copper, and other vital materials; installation time is quicker, and service better.

To help you get your equipment specified, purchased, and installed under this new, short-time plan, a new "handy guide" is just coming off the press. Mail the coupon for your copy today.

General Electric, Schenectady, N. Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance



Factory-assembled, safety-metal-enclosed unit substations are quickly and easily installed right at load centers—without expensive vault construction, thanks to Pyranol. Simply slide the completely assembled sections into position and connect to the primary and secondary cables.

GENERAL ELECTRIC

General Electric Co., Sec. B 302-10
Schenectady, N. Y.

I understand your new handy guide to "Quickly Installed Electric Power Systems" (GED-1006) explains in detail the steps to follow in order to get power to new production machinery in one to six months less time. Please send me a copy.

Name.....

Company.....

Address.....

City..... State.....

302-10-170E

Also for Victory—keep your plant going at full capacity. Avoid frequent shutdowns. Use packings, gaskets and oil seals which give long, dependable service.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Co. of Canada Limited, Montreal, Que.

GARLOCK
The Standard Packing of the World

with the NLRB's policy in this respect. (Scott Lumber Company.)

* *No Compulsory Maintenance for Union Applicants*

WLB granted a union maintenance clause despite the employer's claim that it "has existed for 109 years with an open shop and sees no warrant for a change at this time." Neither is the War Labor Board persuaded by the claim that "the closed shop is contrary to the Wagner Act unless it is negotiated by both the employer and the union." Finally the Board was unmoved by the employer's insistence that "it is the responsibility of the union, not the responsibility of the management, to secure adherence of its members to its organization."

The Board did not, however, agree with the union that applicants for membership as well as actual members should be required to maintain membership. It ruled that applicants should be given an opportunity to reconsider their applications and know in advance that lapse from membership will cost them their jobs. (Brown & Sharpe Manufacturing Co.)

* *WLB Interprets Contract*

WLB greatly broadened the scope of its domain by interpreting a contract when it ruled that non-union members may not be transferred from any company plant to a plant under the jurisdiction of the union unless they agree to join the union in a case where the contract requires that new employees and transferees be members.

If the contract makes no provision for membership requirements in a case of old employees transferred to a new company plant under the jurisdiction of the union, the clause relating to union membership must be interpreted to require non-union members to express their willingness to join the union in order to be transferred. In the event non-union employees already transferred do not state such willingness, they should be returned to their original positions. (Union Electric Company of Illinois.)

* *WLB Warns Employees*

Settlements and their enforcement have been, in the main, exclusively concerned with bringing management in line. The War Labor Board now directs its attention to recalcitrant employees by warning each striker individually that unless he immediately returns to work he faces expulsion from the union and will be ineligible for further employment at the plant, and that his job will be filled by the company with the assistance of the union.

The effectiveness of this warning

was paralleled only by WLB's warning to industry. The threat of disciplinary action brought prompt compliance. (Hathaway Manufacturing Company.)

NATIONAL LABOR RELATIONS BOARD

** Overtime for Time Not Worked*

An employer whose contract provided for a regular 8-hour work day was held not to be justified in reducing the work day. Accordingly the impartial umpire under the General Motors contract held that for such violation of contract the employer was obligated to pay for the hours his employees would have worked, including overtime hours, and 15-minute lunch periods, which were counted as time worked under the earlier schedule.

Where the work was not of an emergency nature, under a collective bargaining contract calling for the division of overtime work at premium pay to be divided among the regular employees as far as practicable, the wages must be paid to those employees to whom the work would have gone, if they had done it, rather than the foremen who have actually performed the work.

Management Liable for Adopting Anti-Union Sentiments

The Labor Board ruled that management was guilty of violating the Wagner Act when it relayed the anti-union advice of local business men through a public address system during lunch periods. By urging, through its supervisors, that employees take note of this advice, management very directly conveyed the impression that the anti-union sentiments relayed were those of the management.

** Arbitrator's Power to Enforce, Upheld*

The New York Supreme Court sustained the power of an arbitrator to compel reinstatement and back pay for discharge of an employee where the arbitrator found that the discharge was in violation of the contract.

This far-reaching power of imposing sanctions upon the violator of a contract was granted to the arbitrator by the court on the ground that if the arbitrator had power only to determine whether an employee's discharge was improper but not to order his reinstatement with back pay, the very purpose for which disputes are submitted to arbitration would be frustrated. (Schenk vs. Thirty-first Street Beauty Salon, Inc.)

The mere fact that a partial motive for discharging an employee was his violation of a safety rule, by failure to

3
BIG SAVINGS
WITH
ROPER Rotary PUMPS

SAVE 50% TIME

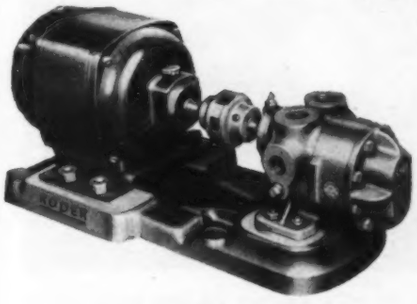
1 Saving of installation time is a most important need of plants producing for Victory — read what one customer writes "So far the new ROPER has proved the easiest of all to install. In fact the last 6 ROPERS we have installed, we saved 18 hours labor — about 3 hours on each."

SAVE 52% SPACE

2 Today with increased production so vital plants welcome opportunities to get efficient equipment that gives them space savings. Roper "direct drive" pumps require only 48% as much floor space as other models.

SAVE 20% POWER

3 Here is another saving important to the Victory program — Roper "hydraulically balanced" Pumps reduce power consumption as much as 20%.



OTHER FEATURES

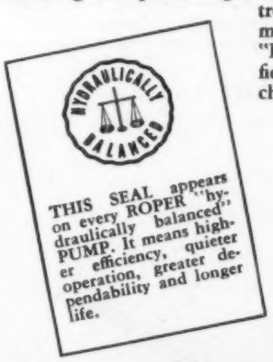
TIME, space and power savings are most important but remember other outstanding Roper features too! Ropers are "always primed" ready for action; are long on suction lift; quieter in operation; simplest in design — only two moving parts; automatically lubricated; leakproof; and absolutely dependable on long hard jobs.

THOUSANDS IN USE

Roper Rotaries are being used by the thousands in defense plants throughout the U. S. Their dependability and the savings they make possible are vital to all who must handle liquids. Manufacturing and processing industries must have trouble-free equipment — that's why "ROPER" is specified on so many purchase orders.

PUMPING ANY LIQUID

Whether for lubricating systems, general transfer work or for use on intricate hydraulic systems, there is a Roper to do the job. Roper Pumps can be standard fitted, bronze fitted or all bronze—capacities from 1 to 1000 gallons per minute—pressures up to 1000 lbs.—speeds to 1800 revolutions per minute—mountings and drives for every practical need.



THIS SEAL appears on every ROPER "hydraulically balanced" PUMP. It means higher efficiency, quieter operation, greater dependability and longer life.

Get this valuable Book of Pumping Information

Send for your free copy of catalog. Learn how you can save time, money and trouble.

ask for Catalog No. 938

GEO. D. ROPER CORP., ROCKFORD, ILL.

DOING A JOB FOR
All Out PRODUCTION!

✓ SAVING TIME ✓ SAVING WORK
✓ FREEING MAN-POWER ✓ SAVING SPACE

IN foundries, ammunition plants, steel and brass mills, aviation machine shops and in scores of other plants, Standard Conveyors are doing an important job—keeping high-speed production machines supplied—moving materials and parts "on schedule" from department to department—freeing manpower for effective work in the nation's "battle of production."

"Conveyorize" To Meet Today's Need For Speed

The 76-page booklet, "Conveyors by Standard," will aid you to determine the best types of power and gravity conveyors to step up production in your plant—suggests how you can "conveyorize" to meet today's need for speed—keep production flowing—utilize every square foot of floor space effectively—save time, costs, and manpower in handling. Write for your copy of Bulletin FM-7, "Conveyors by Standard."

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minn.
Sales and Service in Principal Cities

POWER AND GRAVITY
Standard CONVEYORS
FIRST FOR FASTER PRODUCTION

give an all-clear signal to a locomotive engineer, was held not to justify an employer charged with discrimination. The Board ruled that the circumstances surrounding the discharge made it unlawful. These circumstances included management's opposition to the union, the failure to consult the engineer in charge, and the lack of imminent danger. (Polson Logging Co.)

Shutting Down Plant Discriminatory Discharge

Discharging an employee, even though for cause, may be an unlawful discharge, where the employer departs from his usual practice of closing down gradually and shuts the plant suddenly and completely at a date earlier than he had otherwise planned to shut down. The Board has ruled, in such a case, that there was a discriminatory lockout from the time of the actual shutdown to the time when the shutdown would normally have occurred. Nor is the necessity for readjusting business sufficient ground for withdrawing from interstate operations. Where the Board found, therefore, that there was no reason in business economics for the change, it held that such discontinuance will not shield the employer from the operation of the Wagner Act. (Cowell Portland Cement Company.)

** Remnant of Unit Not Representative*

Where a unit has rapidly dwindled as a result of war dislocations, the Board ruled that the "remnants" of that unit will not be certified as the appropriate bargaining agency. (Crane Company.)

** Grievance Not to Be Individually Presented*

Under the Wagner Act, as thus far interpreted by a trial examiner, an individual has no right to present his grievances before the Labor Board, if grievance procedure is already prescribed by contract. The pressing by an individual of such a claim was held to constitute interference with employee rights, and amounts to refusal to bargain.

** Seniority Rights Included in Reinstatement*

An order of reinstatement requires more than mere restoration to the job when an employee has been unlawfully ousted. It also requires the restitution of the discharged employee's seniority rights. (Quality Art Novelty Company.)

Profit Motive Not Necessary

Private hospitals and other charitable institutions enjoy no special exemp-

CAN YOU IMPROVE ON THE PAPER CLIP?

Hundreds of "gadgets" have failed to measure up in usefulness to the simple principle of the paper clip. Just as scores of "gadgets" for locking a bearing to its shaft have failed to measure up to the Fafnir Wide Inner Ring Ball Bearing with Self-Locking Collar. Bored to inch dimensions, for slip fit on stock shafting, it requires no lock-nuts, adapters, shaft shoulders, or precise machining; it locks to the shaft with just a finger-twist.

This time-saving feature is built into every transmission unit in the complete Fafnir line. It's simple, positive, dependable . . . and exclusively Fafnir. The Fafnir Bearing Company, New Britain, Conn.

Slip the shaft through the bearing.
Lock the collar with a finger-twist.
Set the screw to hold collar locked.

FAFNIR
Ball Bearings
THE BALANCED LINE
MOST COMPLETE IN AMERICA

GET MORE PRODUCTION FROM PRESENT MACHINES

Overhead shafts driving drills, presses, precision boring machines and lathes. The owner said "Rhoads belts have proved themselves superior to any other leather belts we have ever used. They are always the same consistent high quality, long lived belts."

Performance records have proved that Rhoads TANNATE leather belts mean more continuous output at lower unit cost, increased machine speeds, longer service life with fewer interruptions.

The unusual strength and firm pulley grip of TANNATE keep machines running smoothly at full capacity even under varying load conditions. When properly installed, TANNATE requires little maintenance and will stay on the job 24 hours a day, 7 days a week.

Let us help you get more output from your present equipment.

STEP UP PRODUCTION WITH

RHOADS

Founded 1702

Tannate

WATERSHED LEATHER BELTING

J. E. RHOADS & SONS · 35 N. SIXTH ST., PHILA., PA.

NEW YORK · CHICAGO · ATLANTA · CLEVELAND

tion, merely because they are not enterprises conducted for profit. (Central Dispensary & Emergency Hospital.)

Forms of Violation

The Labor Board held that a discharge for "turmoil" constituted a violation of the Wagner Act, when "turmoil" was applied to the usual gatherings and discussions of employees between runs when unionism was the topic of conversation, but not when the topic related to personal or business activities. (Protective Motor Service Company.)

A Labor Board trial examiner has ruled that assistance to employees of other employers is protected by the Wagner Act. Accordingly, an employer was guilty of discrimination when he ordered his union employees to deliver gasoline to a customer who was picketed.

An employer may be guilty of violating the Wagner Act by the quiet endorsement of a union. Such interference was inferred in the promotion of an employee for services in behalf of an AFL union when a CIO union also was organizing employees. (American Smelting & Refining Company.)

Picketing Must Be Unrestrained

Since the Federal Court protects the right to picket as a form of free speech, an ordinance requiring pickets to register daily before reporting for duty was held invalid. (Shaker Heights vs. Klein.)

"Damned by Sins of the Past"

Generally a union allegedly representing a majority must claim such majority representation to hold an employer to his duty to bargain collectively. However, in determining whether the employer violated the Wagner Act, the Board will consider the management's prior unwillingness to meet the union. (Clinton E. Hobbs Company.)

Fewer Clerks Make Up More Payroll

(Continued from page 88)

carnings against the department total production at the various rates. The total hours worked during the day on the total card are then checked against the total hours worked as indicated on the back of the card by the clock stamp. Any differences must be referred immediately to the department foreman.

The cards for the day are then sorted by number groups and a total

QUICKLY INSTALLED · LOW COST · FACTORY FINISHED WALLS

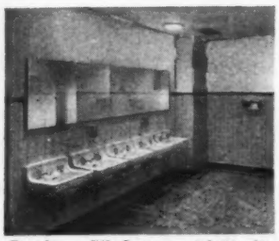
For Dispensaries—Toilet Rooms—Cafeterias, Etc.

with Marlite

Plastic-Finished Wall Panels

(HIGH HEAT BAKED)

Dispensary walls of Marlite Tile-Pattern. Marlite Plain-Color ceiling.



Employee Washroom with Marlite Tile-Pattern walls and Marlite Plain-Color ceiling.

Marlite Walls and ceilings reduce maintenance in research laboratory.

MARLITE makes a simple . . . quick . . . and inexpensive job of providing the kind of cheerful and sanitary employee facilities that invariably result in a marked improvement in workers output, attitude towards management, and cooperation in keeping facilities neat and orderly. Further, the use of Marlite for walls, ceilings, or wainscoting holds maintenance to an absolute minimum and eliminates constant renovating. The low installed cost is considerably less than that of other materials offering comparable sanitation, durability, ease of cleaning and maintenance. Ask your architect or contractor about Marlite. See Sweet's Catalog, Section 11/35, or write direct.

MARSH WALL PRODUCTS, INC., 750 Main St. • Dover, Ohio

Marlite

•Trade Mark Reg. U. S. Pat. Off.

Plastic-finished WALL PANELS

FOR CREATING BEAUTIFUL INTERIORS

PLAIN-COLORS HORIZONTALINE WOOD-VENEERS • • HEATEX • •

TILE-PATTERNS MARBLE-PATTERNS • CARSTENITE • TRIM MOULDINGS

WHAT IS MARLITE?

Marlite is an impervious plastic finish permanently integrated under high heat to a highly compressed oil tempered fibre base. It comes in wall size panels (4 by 4 feet to 4 by 12 feet) and is available in a wide range of colors. There are 3 types of Marlite: (1) DELUXE—high polish, mirror finish; (2) VELVETEX—satin finish; (3) the New low priced War-panels.

FAST, SIMPLE INSTALLATION

Marlite saws easily and requires no special tools for application. Your own carpenter can cut, fit and apply a standard size panel covering up to 48 square feet of wall area in a few minutes. Marlite is applied right over old walls of smooth finished cement or plaster, wood, insulating board, tile. Heavier thicknesses can be applied direct to studding in the case of new walls.

EXTREMELY LOW MAINTENANCE

The high heat baked plastic-finish is extremely sanitary and durable and impervious to acids, alkalies, fumes, soaps, water, alcohol, and other common deteriorants. Requires only an occasional wiping with a dampened cloth to keep it clean. Drastically reduces maintenance.

IMMEDIATELY AVAILABLE

from factory stocks in 12 strategically located warehouses, or direct from factory in Dover, Ohio.

UTILIZE MARSH "KNOW-HOW"

The vast fund of experience we have acquired in pioneering and developing Marlite is available through Marlite Factory Representatives. Each is qualified to advise you on plastic-finished wall paneling for industrial uses. Consult your phone book or write to factory.

★ ★ ★

SEND FOR FREE BROCHURE

"Marlite for War Construction." Shows uses, contains helpful information and actual samples of Marlite.

MARSH WALL PRODUCTS, INC. • 750 Main Street, Dover, Ohio

☐ Please send Brochure "Marlite for War Construction."
☐ Have Representative call.

Name..... *Position*.....

Company.....

Address.....

City and State.....

In thousands of progressive plants, speedy Comet Portable Electric Hoists are now used to keep machines at peak production. Costly interruptions—waiting for materials—have been eliminated. Production output is accelerated by using Comet Hoists on trolleys, monorails and cranes to lift and transport loads overhead. Wherever careful checks are made, Comet Hoists can always point to an important lessening of worker fatigue. With a minimum investment, a few cents a day for operation, and the simplest operating routine—just plug in the Comet Electric Hoist and it goes to work—you can *step up* efficiency, save valuable floor space and *cut down those "hidden" costs.*

ONE HAND CONTROL
One hand controls the CM Comet—the other is FREE to guide the load into position.

SPEEDY
Fast, positive lifting and lowering of the load. Requires but a minute or two to hook up.

ECONOMICAL
Low initial cost...low operating cost. Just a few cents a day operates the Comet.

PLUG IN ANYWHERE
No special outlets or wiring needed...just plug into the nearest outlet—then hoist.

VERSATILE
It's portable...easily removed and installed as it goes from job to job.

CHISHOLM-MOORE Hoist CORPORATION
(Division of Columbus-McKinnon Chain Corporation)
130 FREMONT AVE. TONAWANDA, N. Y.
Branch Offices: NEW YORK • CHICAGO • CLEVELAND

of each employee's amount earned in each group added. This total is posted to the block control for the group. This block control, as previously discussed, is for units of 100 employees. When all the number group block controls have been posted, they are added together and a grand total is posted to the block control. The cards are then sorted by departments, next for each operation in that department. The cards for each operation are totaled, and are posted to the labor distribution report by operation.

Labor Total Added

At the end of each department's operations, a total of the labor is added and posted to the department total line. When all the departments have been added, the grand total of all departments is made. This grand total of labor distribution must agree with the grand total of the block control.

Cards for the day are then slotted on the grooving machine for labor distribution, thus establishing the fact that all dated cards have been posted to block control and labor distribution records. The cards are then sorted by block control number groups, and are filed by these groups until the end of the week. Before this filing operation, the extra cards in each group must be sorted out and filed separately from the regular cards.

When the cards for the last day of the pay period have been filed by number groups, cards for each group are removed from the file and sorted by employee numbers. The daily cards for each employee are added for hours and amount earned, and the total is posted to the weekly summary section on the last card of that week. This last card is then slotted as a summary card.

Everything Checks

When all the cards in the first group have been summarized, the summary cards are added together and the total is posted and checked with the total for the pay period on the block control for the first group. This procedure is followed for each number group until all groups have been added. When each group is balanced, any merchandise deductions are posted to the summary card, and the tax on insurance contributions is figured on the employee's earnings. The total of the two deductions is then subtracted from the total weekly earnings and the result, or net pay, is entered on the card.

Payroll checks are then written for each summary card and the check number is posted to the card. The total of the net pay is written on the

A little attention brings out the good qualities underneath.
A little soap and water can do wonders for a plant's lighting efficiency

The grime that gathers on light reflectors can play havoc with the efficiency of your lighting system. But, if Alzak* Aluminum Reflectors are on the job, it's no trick to restore their original high reflectivity.

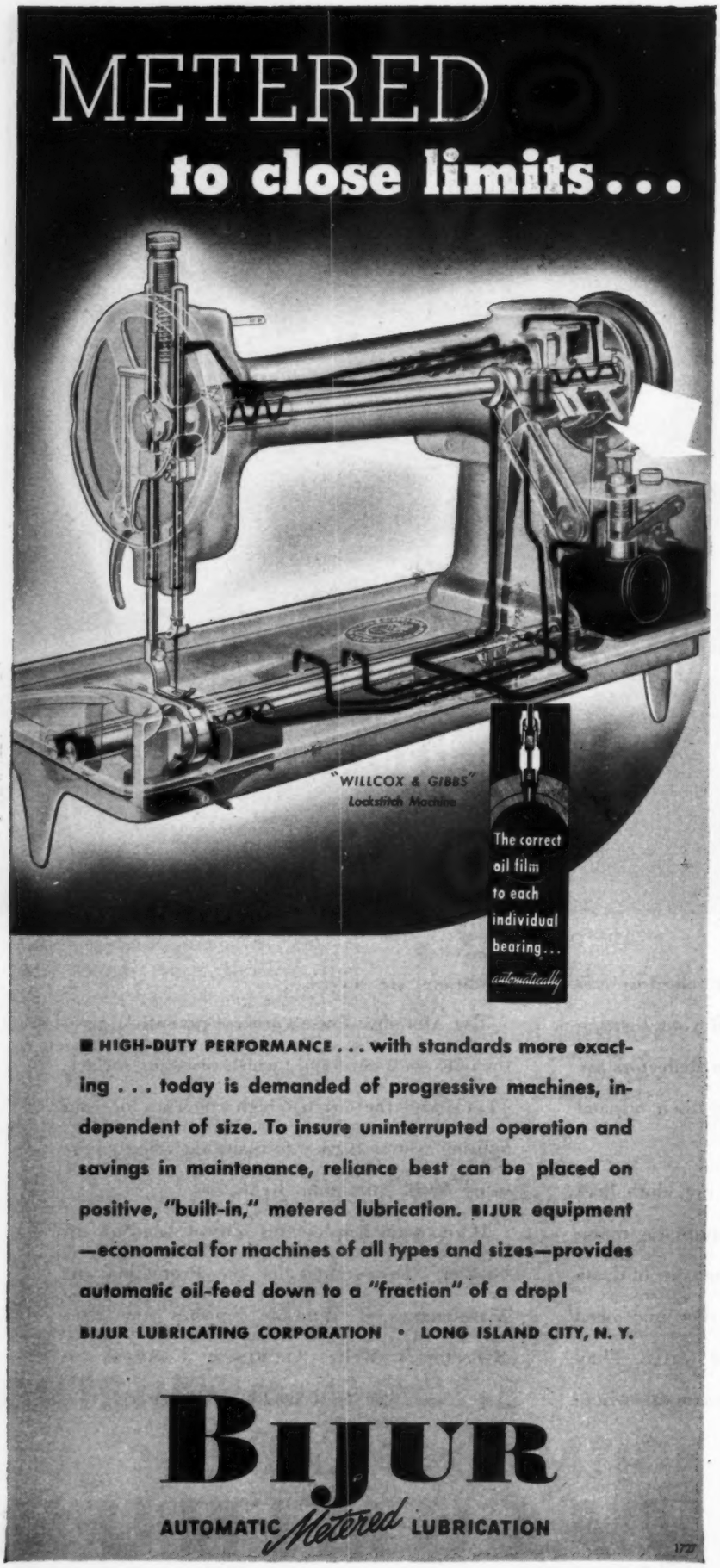
An occasional dusting with a dry cloth may be all that Alzak Reflectors require for maintenance. Or, if they're working out-of-doors or where fumes are in the air, they may need washing with a mild soap and water. They may even need a different treatment where conditions are severe.

The Alumilite finish (process patented) gives the reflector a hard and tarnish-resistant surface. That's why the original high efficiency of your lighting system is easy to maintain when you're using Alzak Aluminum Reflectors.

If you want help on this subject, send for the booklet, "Instructions for the Protection and Maintenance of Alumilite Finishes and Alzak Reflectors." Write ALUMINUM COMPANY OF AMERICA, 2126 Gulf Building, Pittsburgh, Pa.

*Registered Trademark

ALCOA ALUMINUM


METERED
to close limits . . .
"WILLCOX & GIBBS"
Lockstitch Machine
The correct oil film to each individual bearing . . . automatically
■ HIGH-DUTY PERFORMANCE . . . with standards more exacting . . . today is demanded of progressive machines, independent of size. To insure uninterrupted operation and savings in maintenance, reliance best can be placed on positive, "built-in," metered lubrication. BIJUR equipment —economical for machines of all types and sizes—provides automatic oil-feed down to a "fraction" of a drop!
BIJUR LUBRICATING CORPORATION • LONG ISLAND CITY, N. Y.
BIJUR
AUTOMATIC Metered LUBRICATION
1727

check and the total for the group is checked by adding to it the total of the deductions. This total is then checked with the block control for the week; when in agreement, the checks are signed and issued.

Checks Written

It is not necessary for the entire week's earnings to be computed for the total number of employees before checks can be written. Each week, labor distribution sheets for the week are added across to a total by operation, by department, and for all departments for the week. A total of the labor distribution for all departments must then agree with the weekly earnings on the grand total block control.

Checks are typewritten, and an employee's earning record is made up simultaneously, thus insuring absolute control on earnings paid to and social security taxes deducted from each employee in the company.

Records by Camera

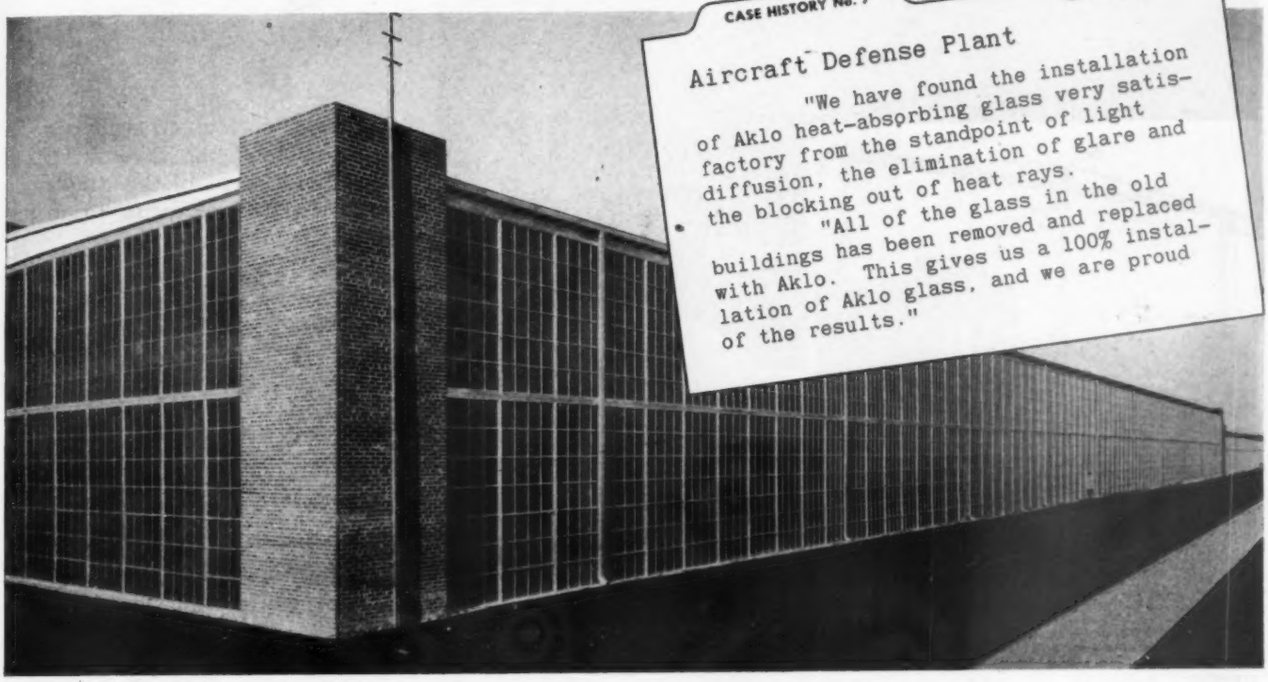
(*Continued from page 98*)

special tests can greatly increase the productive capacity of this department. A picture records the apparatus and method, so that one year or five years later the test could be duplicated. When a picture is included with a written report, it takes the place of several paragraphs of narrative, and conveys a clear picture of procedure and a realistic portrayal of the test.

Figure 5. Photographs of special methods or tests provide a record by which one year, or five years, later the test can be duplicated

In making comparative tests, photographs give an accurate and complete description of what happened, and the difference between two prod-

14,830 REASONS why this plant is Speeding Vital Plane Production


CASE HISTORY No. 7
Aircraft Defense Plant
"We have found the installation of Aklo heat-absorbing glass very satisfactory from the standpoint of light diffusion, the elimination of glare and the blocking out of heat rays.
"All of the glass in the old buildings has been removed and replaced with Aklo. This gives us a 100% installation of Aklo glass, and we are proud of the results."

100% installation of AKLO GLASS eliminates eyestraining glare and fatiguing sun heat

REDUCES GLARE—eliminates eyestrain and employee fatigue.

RETARDS SUN HEAT—keeps workers comfortable on their jobs.

RENDERS SAVINGS—eliminates shades or painting of glass.

In this huge new aircraft plant, 14,830 lights of AKLO glass guard workers against unnecessary fatigue. Frosted AKLO admits soft, diffused daylight—without the glare that causes eyestrain, often leads to errors and accidents. Costly shades or bothersome painting of glass are eliminated.

By filtering out 97½% of the sun's infrared rays, Frosted AKLO keeps the interior comfortably cool in summer. Employees feel better and work better. Temperature is more easily controlled for fitting of precision parts. Operating costs with air conditioning equipment are substantially reduced.

AKLO glass is manufactured by Blue Ridge Glass Corporation, Kingsport, Tenn., and sold by Libbey-Owens-Ford through leading glass distributors. It is available in hammered and ribbed patterns, both wired and unwired. For full information, write Blue Ridge Sales Division, Dept. 1159, Libbey-Owens-Ford Glass Company, Toledo, Ohio.

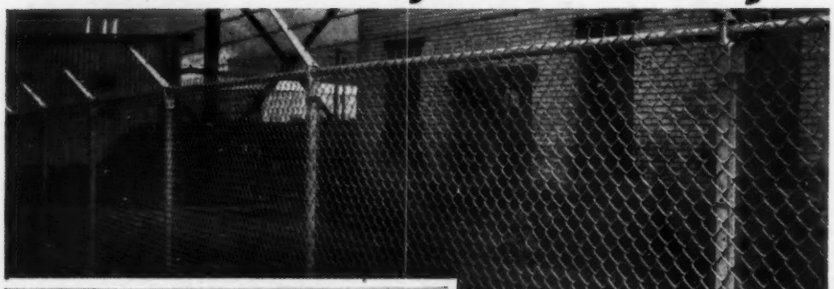
L O F

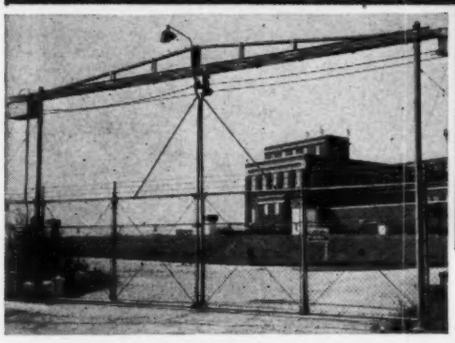
BLUE RIDGE AKLO GLASS

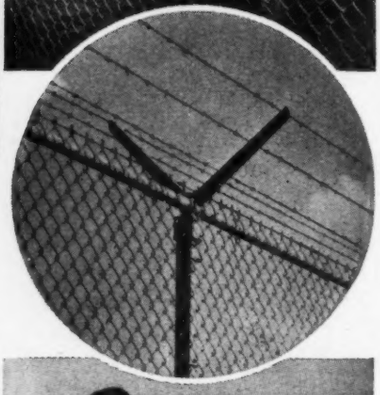
Heat-Absorbing · Glare-Reducing · Figured and Wire Glass

BLUE RIDGE GLASS CORP. QUALITY GLASS

Spies and Saboteurs —don't like Cyclone Fence!







Spies and saboteurs know that their chances are far from good when a plant is enclosed with U·S·S Cyclone Fence. They realize that the tough wire mesh and the barbed wire top make their job difficult—and are sure to spoil the get-away.

Cyclone Gates are easy to operate. The sliding gate illustrated above is controlled electrically from inside the plant. Cyclone single and double drive gates swing on ball-and-socket hinges.

The Cyclone Victory Fence at the right, with its barbed wire extended on both sides of the fence gives maximum protection. Other types of fence tops are available.

Cyclone's own factory-trained erection crews can build your fence for you. These men know how to build fence right. They are on our payroll and we are responsible for their work.

THOUSANDS of plants vital to America's war effort are guarded from spies and saboteurs by U·S·S Cyclone Fence. Not only the plants themselves—but yard inventories, railroad sidings and parking lots as well. And many have extra enclosures around danger spots within their plants. Only when every person must show credentials at guarded gates can you feel sure about your property.

We will gladly help you work out your fence problems. There is no obligation in asking for the help of our experienced men. When you buy fence, remember this. More plant owners choose Cyclone than any other property protection fence. The reason is found in Cyclone's reputation for sturdy, long-lasting fence. In our fifty years of fence building we have learned how to do the job right.

CYCLONE FENCE DIVISION
(AMERICAN STEEL & WIRE COMPANY)
Waukegan, Ill. • Branches in Principal Cities
United States Steel Export Company, New York

USS **CYCLONE FENCE**

UNITED STATES STEEL

32-Page Book on Fence

Send for our free book on fence. Crammed full of facts, specifications and illustrations. Shows 14 types — for home, school, playground and business. Buy no fence until you see what Cyclone has to offer.

CYCLONE FENCE
Waukegan, Ill., DEPT. 972

Please mail me, without obligation, a copy of "Your Fence—How to Choose It—How to Use It." I am interested in fencing: ☐ Industrial; ☐ Estate; ☐ Playground; ☐ Residence; ☐ School. Approximately _____ feet.

Name_____

Address_____

City_____ State_____

ucts comparatively tested (Figure 6). A narrative description would not convey all the details, and at best would represent only one observer's opinion. The picture is almost as good as the original, and yet can be filed away with the other pertinent information concerning the test.

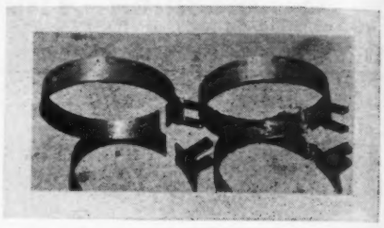


Figure. 6. In making comparative tests photographs give an accurate description of the difference between two products so tested

Another effective use of photography in the testing and research department is giving detailed descriptions of special chemical apparatus for research investigation. One or two good pictures of a special assembly or apparatus can be taken in five or ten minutes, whereas it might take three or four hours to draw up such a set-up and label it.

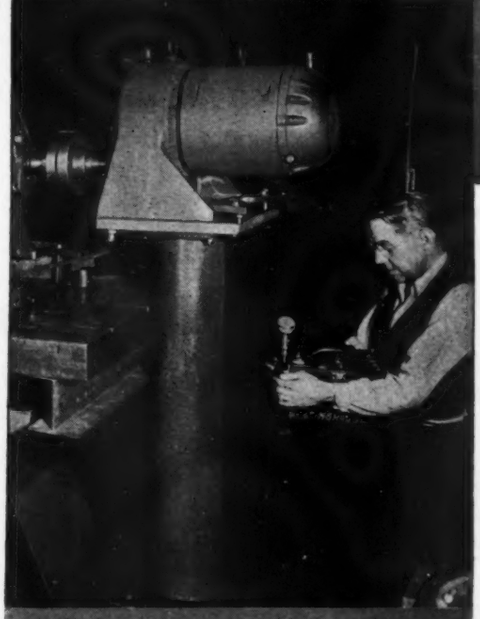
Tested to Destruction

Figure 7 shows the parts of a welded experimental structure that was tested to destruction after welding. The laboratory job number, material and procedure used, and the subsequent treatment of the part are included in the picture by photographing a printed notice with the part. The label avoids confusing this test with others somewhat like it; is a practical way of getting the labeling done quickly and accurately; and it furnishes a convincingly authentic record for future reference.

Photography can play an important and economical role in making reliable records of routine metallurgical tests and heat-treating processes for regular production items or special units. Test pins or other test specimens that are processed in the heat-treating department with other regular parts can be polished, etched, and photographed, yielding a photo-micrographic record that can be examined by the metallurgical supervisor in only a few minutes, whereas it would take many times the amount of time and attention if he had to examine each part separately. The microscopic examination of such test pins often is the only satisfactory method of checking the results of the treatment, and the only satisfactory and lasting record of such examination is a photograph. Measurements of carburizing case

IT'S *Quiet* AT THE COOLING TOWER

The Westinghouse Gearmotors that power the fans in this 3200-GPM mechanical draft cooling tower, heart of the air conditioning system of New Orleans Municipal Auditorium, create *less* sound than the fans they drive.



Measuring, by means of an "electric ear," the sound produced by a Westinghouse cooling tower Gearmotor Drive operating under full load. Every cooling tower Gearmotor is given this test.

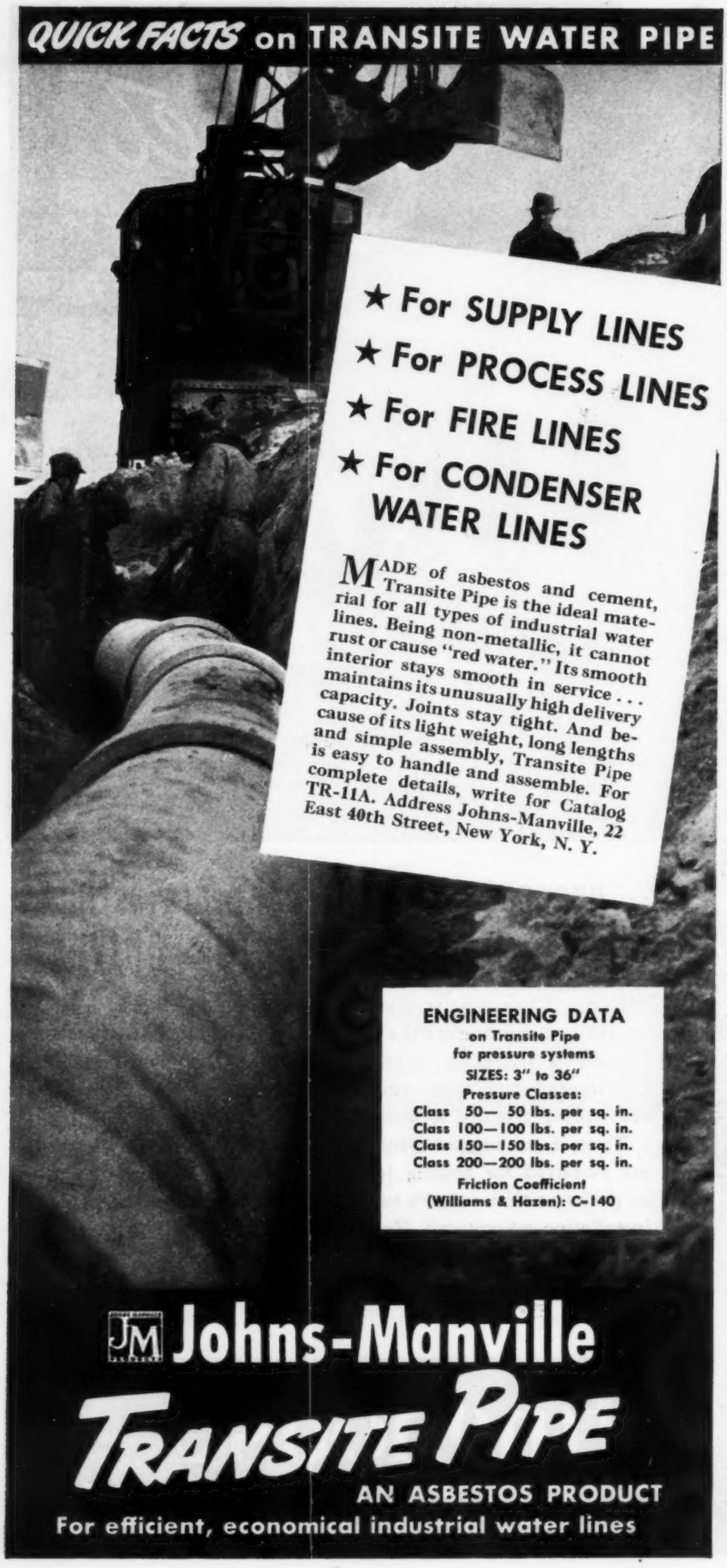
...because "electric ear" pretesting insures quiet GEARMOTOR DRIVES

"Shaving," the process that first took the noise out of automotive gearing, finishes the gears and pinions of Westinghouse Gearmotor Drives to the industry's closest tolerances. Pretesting, under actual load conditions, insures that the drive will *stay quiet* in actual service.

These facts suggest why Westinghouse Gearmotor Drives are preferred for cooling tower installations. Integral design at the same time reduces maintenance and provides important installation advantages. You'll find it worth-while to investigate them and to specify Westinghouse Gearmotor Drives for any cooling tower installations. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-94472

Westinghouse GEARMOTORS


QUICK FACTS on TRANSITE WATER PIPE
★ For SUPPLY LINES
★ For PROCESS LINES
★ For FIRE LINES
★ For CONDENSER WATER LINES
MADE of asbestos and cement, Transite Pipe is the ideal material for all types of industrial water lines. Being non-metallic, it cannot rust or cause "red water." Its smooth interior stays smooth in service . . . maintains its unusually high delivery capacity. Joints stay tight. And because of its light weight, long lengths and simple assembly, Transite Pipe is easy to handle and assemble. For complete details, write for Catalog TR-11A. Address Johns-Manville, 22 East 40th Street, New York, N. Y.
ENGINEERING DATA
on Transite Pipe
for pressure systems
SIZES: 3" to 36"
Pressure Classes:
Class 50— 50 lbs. per sq. in.
Class 100—100 lbs. per sq. in.
Class 150—150 lbs. per sq. in.
Class 200—200 lbs. per sq. in.
Friction Coefficient
(Williams & Hazen): C-140
JM Johns-Manville
TRANSITE PIPE
AN ASBESTOS PRODUCT
For efficient, economical industrial water lines

depth, grain size, and other metallurgical considerations can be made upon photographs hours, days, or years after the original part has been examined and photographed.

Showing Operators How

In the preparation of illustrations for parts catalog books and for operator instruction literature, the use of photography is an enormous time-saver.

For instance an earth-moving unit is photographed. After the picture is taken, the background is masked out, a phantom view traced, numbers and arrows are drawn in, a detailed view is added and the significant items, such as wire rope lines and the sheave wheels over which they pass, are shaded in, and the whole drawing is reproduced. This process gives faithful reproductions of the units so that they are correct in detail and easily recognized. The whole layout can be produced in a few hours. By this method it is possible to get parts catalogs or operator instruction sheets out within a day or two after the picture is taken.

Figure 7. Parts of a welded experimental structure that was tested to destruction after welding. Pictures show what happened

A photographic method of reducing large blueprints and tracings is an effective way of preparing bulky prints for use in a compact and usable form. For example, a 36x72-in. layout tracing can be reduced to 6x12 inches for the preparation of specification sheets. In these days of government priorities and requests for specifications in large quantities on short notice, the use of photography in preparing such information is a useful time-saving device. The additional convenience of studying a reduced layout rather than attempting to study a 36x 72-in. print on an ordinary executive office desk is not to be underestimated.

For the Planning Department

Another phase of factory engineering that uses photographic processes in connection with layouts and factory maps is the planning department. A

MULTIPLIES MAN-POWER!

WALKER-TURNER Radial Drill

• Here is a machine that has solved many problems in our War Industries. Extensively used for drilling, tapping and routing. Aviation plants use many for stack-drilling sheets and spars and for other operations. Ship-builders, too, use them for drilling plates and sheets. And these are only a few of dozens of different applications. Priced from $325 with motor, shipment can be made in from 4 to 6 weeks to plants engaged in war production. • *Send for literature.*

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● Model RD1175-J has built-in ball-bearing jack-shaft, permitting speed range from 110 to 5400 R. P. M. with 1140 R. P. M motor.

● Ball thrust bearing on column of Model RD1175-J makes it easy to swing head to left or right. Improves accuracy . . . and lessens fatigue.

● On all models the head can be tilted to 45° left or right.

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HOW TO PRODUCE MORE STAMPINGS IN 1/5 THE SPACE!

THESE STAMPING PRESSES were originally located in another building where they required at least five times as much floor space.

When, because of the need for this floor space, it was decided to move the presses, Alvey-Ferguson Conveyor Engineers were consulted.

The result—an A-F Live Roller Conveyor installation onto which the boxes of cast alloy material and tote boxes are placed. Set at right angles to this power conveyor are roller sections which are used by the operators to pull empty tote boxes closer to the individual machines. Small overhead cranes pick up the heavy boxes and place them on the conveyor.

Every consideration has been given to assist the operators in eliminating waste motion and speeding up production.

Many other plants, after installing A-F Conveyors, have recently boosted production while saving floor space. A consultation will put you under no obligation. Write, wire or phone for an appointment—or write for folder today!

The Alvey-Ferguson Co., 127 Disney St., Cincinnati, Ohio.

ALVEY-FERGUSON *Conveyors*
AND PRODUCT WASHING MACHINES

regular factory map, enlarged by photographic means, may be used for departmental planning, and large factory maps may be reduced and used by the planning department for such functions as inventory maps, machine layout maps, or over-all factory location layouts, in a size that can be conveniently filed or used.

An Authentic Record

Photostating legal papers, checks, tables, blanket priority certificates, or other important documents that must be faithfully and authentically reproduced is an effective means of obtaining copies. A photostatic reproduction is obviously a copy, and yet it is usually acceptable evidence of the existence of the original document.

Figure 8. Simple photographic apparatus can be used for identification of employees. Picture includes man's height as well as his clock number

Identifying employees of a factory organization is another function that may be well served by photography. Figure 8 shows the rather simple photographic apparatus that can be used for routine photography of new employees, giving not only a picture of the employee, but also a record of his clock number and his height in inches. This small portrait can then be filed in the personnel department with the employee's application blank and other data, and a copy can be placed in his identification badge, which must be shown to the watchman before he is admitted to the factory premises. Here again, photography gives an authentic, inexpensive, and easily used means of identifying the employee.

Many Uses for Photography

These examples of the way photography can be used in modern industry are but a few of the great variety of ways in which pictures may take the place of more cumbersome and time-wasting methods of making and keeping industrial records.

Every pound of materials you save .... is a pound more for someone else TO USE !

LET US HELP YOU TO *Save Vital Alloys*

• Either as tools or as raw materials, alloy steels enter into the production of practically all war equipment. *Use these steels wisely; use them well!* That is an infallible way to speed up production; it is also the *only* way to conserve strategic materials . . . to spread the nation's supply of metals and alloys over the greatest possible amount of actual production.

Write us your alloy steel problems—you'll get your answer either in printed form, or in the personal assistance of our Technical and Field Service Staffs.

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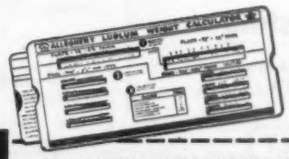
Just use the coupon below



in figuring the weights of alloy steel sections—shapes or flats.

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17 Complete Lines of Fine Hand Tools for Industry in the Stanley Tool Catalog No. 50

This 56 page guide book of hand tools for industrial production and maintenance is helping men everywhere save time in selecting the right tool for the job.

Among the most widely used of all Stanley Tools, Screw Drivers are offered in types to meet the requirements of every job. The popular "Stanloid" composition breakproof and shockproof handle that will not soak up oil or water is offered in many driver styles. Drivers and Bits for Phillips Recessed Head Screws are made in all standard sizes. You can choose any Stanley Screw Driver with complete assurance of lasting satisfaction. Your local distributor will supply you.

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A Complete Line of Tools under each Index Listing

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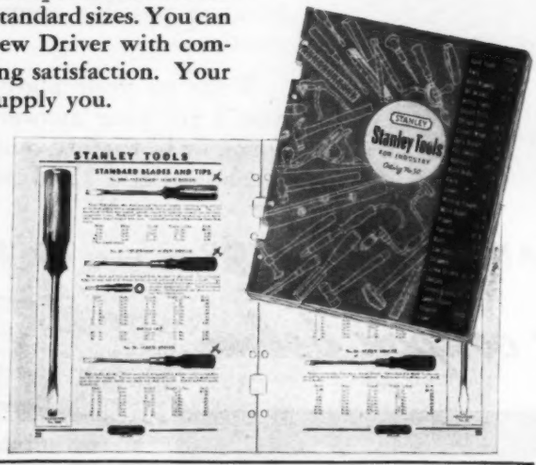


STANLEY TOOLS
DIVISION OF THE STANLEY WORKS
151 Elm Street, New Britain, Connecticut
THE TOOL BOX OF THE WORLD

Management Shorts

(*Continued from page 100*)

has proceeded through all operations in the first department and is ready to proceed to the next, the "move ticket" is removed by the trucker and sent to the production department. The cost ticket is removed and sent to the cost department so that they can cost the production.

In the event that operations other than those set up in the standards are performed, a special time ticket is provided which must be authorized and OK'd by the foreman. These are collected by the payroll department and listed for the cost department and department supervision.

The coupon strip eliminates the making out of time tickets in the shop (except for extra operations), provides a routing for the work, provides more tickets at key points for production control, and facilitates cost control.

•

One midwestern plant fastens a small metal "victory flag" bearing a white star on a dark field to machines working a full 7 days a week, 24 hours a day, and so distinguishes them from those operating only part of the time.

•

Tests, Puzzles, Aid in Selecting War Workers

SOURCE—Westinghouse Electric & Manufacturing Company, East Pittsburgh

Valuable time can be lost daily when "square-peg" workers are assigned to "round-hole" jobs. In adding to our personnel for war production, we are using psychological quiz tests and three-dimensional jigsaw puzzles based on many years' experience in devising methods of fitting each worker exactly to the task where requirements, talents, and temperament match.

Six tests are given to each applicant. They include an interview with a specially trained personnel man, jigsaw-puzzle test to determine nimbleness of fingers, expression of feelings on 200 subjects ranging from writing reports in detail to men who use perfume, general-knowledge test, 10-question examination to demonstrate grasp of basic mathematics, and a second and more intricate jigsaw puzzle test to prove that fingers and mind work well together.

"Would you rather direct men or machinery?" "What are your hobbies?" are some of the questions asked to determine likes and dislikes. In the test on 200 subjects dealing with school subjects,

personal traits, hobbies, trades, and professions, time is limited so that written remarks will express the applicant's first reaction.

The three-dimensional puzzle consists of a wooden cube about 9 inches on a side. It is sawed into eight intricately shaped pieces which must be taken apart and put back together again. The problem is to see how quickly and accurately it can be reassembled.

The second jigsaw puzzle test is made up of 12 pieces and is so intricate that skilled workers on whom it has been tried have averaged 5 minutes for its dismantling and reassembly. Here the method of approach is what counts rather than the time taken. We consider it an important factor in grading applicants.

In the mathematics test we ask true-false questions and pose simple problems to reveal the applicant's basic knowledge.

It is interesting to note that since 1937 only 18 percent of the 10,000 applicants have passed the tests. Their value is shown by the fact that less than 1 percent of applicants enrolled have failed to make good as skilled workmen.

•

Wanted: A Foot Pedal Guard for Press

M. A. JUDD, Personnel Supervisor, Lyon Metal Products, Inc., Aurora, Ill.

We needed a safety guard for the foot pedals on our punch presses to protect them against falling wrenches and heavy materials being worked on the press bed. The management posted notices on shop

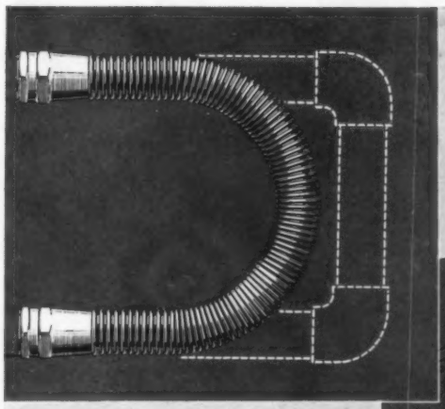
bulletin boards asking for employee suggestions. They read, "We want a suggestion for a simple way to guard the pedal on a punch press so that an object dropping from the bed of the press, a truck handle, or wheel cannot cause the press to operate. Remember that your idea must allow the press to be operated freely with the foot. Put your suggestions and sketches in the suggestion boxes."

An employee in the standards division won the $5 award for the best idea. He proposed a guard made of metal heavy

add speed

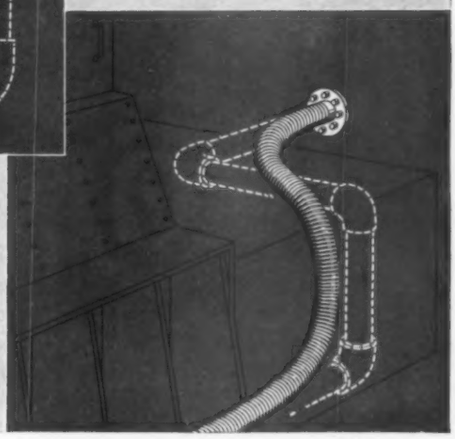
to assembly, maintenance, repair and temporary hook-ups

Use flexible metal hose . . . for pipe connections where speed of installation is paramount



Rex Flexible Metal Hose can be bent to position by hand and coupled, in a fraction of the time required to fit a pipe connection. ←

Rex Flexible Metal Hose can be "snaked" quickly into place in installations requiring turns, eliminating all intermediate connections. →



Rex Flexible Metal Hose speeds up production, facilitates assembly, reduces down-time. Ask for recommendations on the type of metal hose best suited to your needs from the wide and diverse Chicago Metal Hose production types available.

Use our production capacity to increase your production

Rex-Weld Corrugated Flexible Metal Hose • Rex-Tube Interlocked Flexible Metal Hose • Rex-Flex Stainless Steel Flexible Tubing Avioflex Oil Line Hose • Cellu-lined Hydraulic Hose

CHICAGO METAL HOSE CORPORATION

MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Illinois

FREE

to Plant Maintenance Superintendents, Plant and Safety Engineers . . . This

NEW DIGEST *Just off the press!*

A DIGEST OF
28
essential maintenance jobs generally performed in factories and mills and on which Oakite materials are being successfully used to save time, money and effort.

Concise, informative, it has been prepared for busy plant executives to conserve their time, help them increase efficiency of various recurring maintenance problems.

Describes 28 Maintenance Jobs that can be handled EASIER and FASTER!

War conditions are multiplying plant maintenance problems in every factory and mill. Here in this Digest you will find data on 28 different jobs, each one based on the successful experience of many plants. On each is outlined the method followed, the Oakite material used, the advantages gained, the time saved, the fire or other hazards eliminated.

You will have many of these maintenance jobs to do in your plant. Here is your opportunity to benefit by what others have discovered to speed-up this essential work and increase efficiency in handling these jobs.

Write For Your Copy TODAY . . . No Obligation

Time is at a premium these critical days. This Oakite Digest points out proved ways to save it and conserve man-hours for other work. Address us on your business letterhead and your FREE copy will go forward immediately. Send for it today.

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METHODS SERVICE FOR EVERY CLEANING REQUIREMENT

enough to deflect falling objects so that they would not land on the foot pedal extending out past the base of the press. He also recommended that the guard be fastened to the base frame or upright tie rods.

In using this suggestion we altered the design to include an upper edge rolled so as to protect the operator's shin against injury. We also made a slot to allow the pedal to come through, and then anchored the guard to tie rods at the top and to the floor at the bottom so that it would stay put.

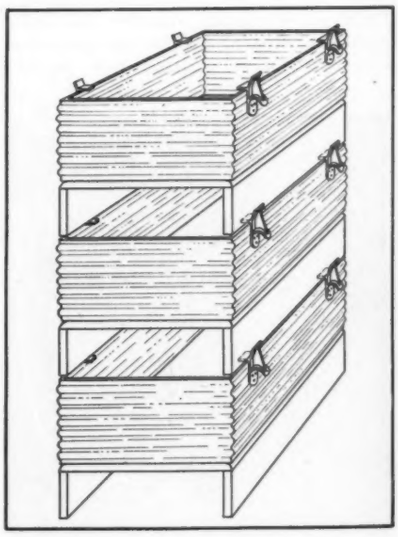
In all, about 30 ideas were submitted. They came in from all sides—from press and brake operators, assemblers, maintenance men, the standards division, office help. We put an item in the employee house organ telling the story, explaining how the winning idea was used, and thanking those who had used their time and thoughts in contributing items and cooperating with us.

•

Stacked Skid Boxes Save Floor Space

R. A. SHAW, Murray Corporation of America, Detroit

Three skid boxes, piled one on top of another, are shown in the sketch. Tiering the boxes in this way was made possible by riveting to their sides the cast steel



brackets shown. Four of these brackets on a box provide a rest on which the next higher box can be placed.

The brackets were so designed that hooks can be placed under them, thus making it possible to move the boxes on cranes or hoists as well as on the power or hand trucks on which the boxes are more commonly transported.

At a small cost for the brackets these boxes can now be used more economically, because of the savings in floor space required and the number of trips the moving agent—crane or truck—must make.

SANITARY FACILITIES

FOR AMERICA'S WORKER ARMY

Industrial plants that have installed Crane plumbing equipment are finding their investment well repaid in long life and low maintenance cost.

VASTLY increased production—expanding plant capacities—workers on triple shifts—all this increased war activity has brought added burdens to the sanitary facilities of America's industrial plants.

More washrooms are needed and it is important that the equipment in these rooms be designed to stand up under the rough uses to be expected in this service.

The complete line of Crane plumbing equipment includes fixtures specially designed to meet the needs of public washrooms and, what is more, this equipment uses a minimum of critical material.

Consult your plumbing contractor or phone the nearest Crane Branch for full information on equipment to expand your washroom facilities to care for your increased payrolls.

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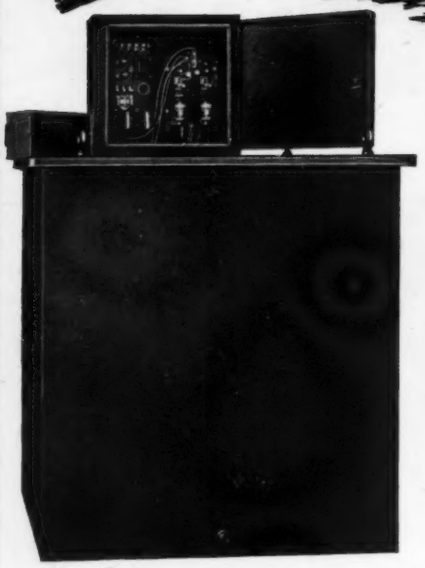
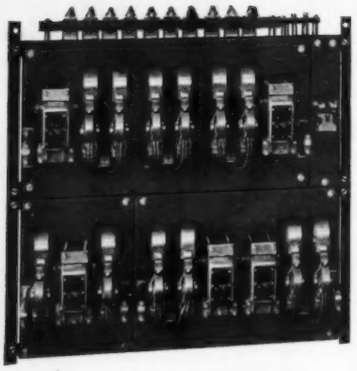
STARTER FOR Long-Time STARTING OF SCAVENGER BLOWER DRIVE





Acceleration by EC&M NEO-TIME Control

FOR operating a scavenger blower in a municipal diesel plant, this EC&M oil-immersed, auto-transformer starter provides reduced voltage starting of the 350HP, 440 volt motor. A heavy-duty starter (capable of long-time acceleration on the auto transformer) keeps starting current low.

Transition from reduced voltage to full line voltage is by EC&M NEO-TIME control, conveniently located in overload relay compartment. The enclosing cover for NEO-TIME panel setting on oil-tank cover is shown in view at left.

EC&M Type LZ Magnetic Contactors for handling the main motor circuit are shown in view at right. They are mounted in the oil-tank with auto-transformers and are completely oil-immersed. During transition, the circuit to the motor is not broken; instead, continuous torque is applied to the motor from the instant of starting.

Booklet No. 88 illustrates this attractive unit as well as many other custom-built motor controls. Write today for your copy.

THE ELECTRIC CONTROLLER & MFG. CO.
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BRAKES MAGNETS LIMIT-STOPS MOTOR- CONTROL

BOOKS

TRADE AND JOB ANALYSIS

Verne C. Fryklund, Ph.D., Associate Professor of Industrial Education, University of Minnesota, Minneapolis. The Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee. 167 pages. Forms, charts, index. $1.75.

Compact presentation of the underlying principles of trade and job analysis. By comparison drawn from familiar trades and by ample definition of terms, all phases are clarified. The necessity for making analyses is discussed, and the jobs of typical workers in industry are described. Chapter headings include: "Trade and Job Analysis," "Modern Industrial Workers," "Kinds of Analysis," "Identifying Trade Elements," "Making the Analysis," "Suggestions for Course of Study Building," and others.

WOMEN IN WAR INDUSTRIES

Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J. 82 pages. Bibliography. $1.50.

Summarizes the principal personnel problems facing industry in connection with the greater employment of women, and evaluates the methods that have been used to meet these problems in the United States and Great Britain. Chapter headings include "Selection and Placement," "Induction and Training," "Hours of Work," "Wage Rates and Wage Policies," "Health and Safety," "Problems Outside the Plant Affecting Women's Work in Industry."

PHILOSOPHY OF ORGANIZATION

Norman L. Schreiber. Professional Lecturer in Industrial Management, Illinois Institute of Technology. A. Kroch & Son, 206 N. Michigan Ave., Chicago. 131 pages. Charts, bibliography. $2.50.

Does not attempt to be original in its treatment of the fundamentals involved in giving permanence to business structures. It is rather a compilation of the best thinking of outstanding personalities in the science of management, according to the author's preface. Chapter headings include "Administration," "Organization," "More About Administration," "Planning," "Organizing," "Command," "Co-Ordination," "Control," "Authority," "Span of Control," "Policy," "Relationships," "Organization Again!"

CORPORATION AND MANUFACTURING ACCOUNTING

H. A. Finney, Ph.B., C.P.A., Professor of Accounting, Northwestern University. Prentice-Hall, Inc., 70 Fifth Ave., New York. 534 pages. Forms, examples, index. $4.65.

Prepared for persons who, having some knowledge of bookkeeping, would like intensive training in corporation and manufacturing accounting. Assignment material is provided in the form of questions, problems, and practice sets.

TRAINING MANUAL FOR AUXILIARY FIREMEN

Horatio Bond, Chief Engineer, National Fire Protection Assn., W. Fred Heisler, Research Specialist, Oklahoma Agricultural and Mechanical College, and R. J. Douglas, As-

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sistant Professor of Firemanship, Oklahoma Agricultural and Mechanical College. National Fire Protection Assn., 60 Batterymarch St., Boston. 406 pages. Photographs, drawings, charts. $1.50.

Will be particularly helpful in plants that have recruited auxiliary firemen, and where specific instruction is necessary. Follows closely regular firemen's instructions.

LET'S WRITE GOOD LETTERS

Sherman Perry. The American Rolling Mill Co., Middletown, Ohio. 176 pages. Index $1.

Revision of original "Making Letters Talk Business" published in 1924 by the same company. Although pointed primarily at American Rolling Mill employees, with examples from Armco experience, suitable for anyone who needs help in writing simple, clear business letters. Discusses many common faults in grammar and composition, and gives sound advice on office procedure to employees and managers.

INDUSTRIAL STATISTICS

H. A. Freeman, Assistant Professor of Statistics, Massachusetts Institute of Technology. John Wiley & Sons, Inc., 440 Fourth Ave., New York. 178 pages. Forms, charts, index. $2.50.

Statistical technique in industrial research and quality control. Gives examples of the uses of elementary statistical methods in the design and analysis of experiments carried out in industrial plants and scientific laboratories. Also deals with the problem of establishing a systematic program through which the quality can be studied and controlled.

INDUSTRIAL RELATIONS IN GERMANY, 1914-1939

Waldo Chamberlin. Stanford University Press, Stanford University, Calif. 403 pages. Index. $5.

As annotated bibliography of materials on industrial relations in Germany available in the Stanford Universities Libraries, and particularly in the Hoover Library on War, Revolution, and Peace. Note on German labor law provides background material to enable those studying German industrial problems to understand how Germany's labor legislation has developed under different forms of government and under the influence of changing social philosophies. Materials annotated include documents, society publications, newspapers and periodical publications, monographs, studies, and articles.

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Prepared by a staff of technical experts under the direction of E. Molloy. Chemical Publishing Co., 234 King St., Brooklyn, N. Y. 128 pages. Drawings, photographs, tables, index. $2.50.

A practical guide in the erection and installation of machines and structures on site. Information has been gathered to provide erectors and installation engineers with a sound, reliable guide on the procedure to be adopted in dealing with the various types of engines and power-driven machinery.

AMERICAN STANDARD DEFINITIONS OF ELECTRICAL TERMS

American Institute of Electrical Engineers, 33 W. 39th St., New York. 311 pages. Index. $1.

Definitions of technical terms used in electrical engineering, including correlation of defi-

(Illustration from photo by U. S. Army Signal Corps.)

WHEN THESE FELLOWS WERE RIDING *Tricycles*

● *Twenty years ago,* as little lads, these fighting men of today were pedaling tricycles down quiet streets, with no knowledge of a war just ended; no idea of a still greater war to come — a war in which they were to play so important a part.

Twenty years ago, in a world at peace, The Sisalkraft Co. began producing a reenforced waterproof wrapping paper, later named FIBREEN, with no comprehension as to the important part it, too, would play in this world war.

For twenty years, The Sisalkraft Co. has been acclaimed the leader in the development and production of reenforced papers — papers that are recognized in all parts of the world *because of their waterproof protective quality, and their almost unbelievable strength.*

As a result of these twenty years of constant development and improvement, and due to exclusive construction methods and the designing of special equipment and machines, the FIBREEN of today requires a very minimum of sisal fibres.

In addition, there is a saving of vital time and labor because FIBREEN is now produced 15 times faster than many of the materials that it is so effectively replacing, and it is requiring only 11% as much labor. At the same time FIBREEN is releasing burlap, tarpaulin and other fabrics and wrapping materials for other important war uses.

The entire production of FIBREEN is now helping to solve the problem of wrapping and protecting great quantities of war material, from tanks and planes to radios, guns and repair parts.

FIBREEN is waterproof—and tough. It is used as a wrapper, as a cover, or as a bag. It guards against damage from rain, dirt, sea water and long exposure to all kinds of weather.

If you are engaged in essential war production—if FIBREEN in your plant can replace and release other critical materials for urgent war uses, and solve your problem of protecting goods either in transit or in storage—write us and we'll try to help you. Tell us what you make and how you now pack it.

THE SISALKRAFT CO.

Manufacturers of Sisalkraft, Fibreen, Sisal-X, Sisaltape and Copper-Armored Sisalkraft

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PEREY SYSTEMS aid guards in making identification air-tight and fool-proof.

When guards are reinforced with Perey Passage Control Systems they are less subject to fatigue, lowered efficiency and carelessness. Without these systems guards are never certain that saboteurs have not slipped by unobserved.

Perey Turnstiles never tire. They function efficiently and speedily 24 hours a day – seven days a week.

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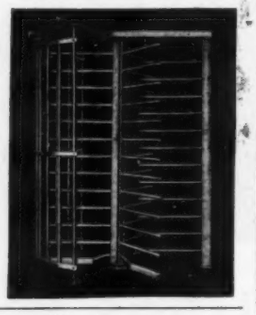
Perey Engineers are at your service to help you plan an efficient turnstile control system. They have had greater experience in the design and installation of turnstile systems than any other organization in the world.

Perey Turnstile Systems are rapidly becoming standard protection equipment in our Navy Yards, Arsenals, Shipyards, Aircraft Plants, Industrial Plants.



PEREY TURNSTILE COMPANY
WAR PLANT PROTECTION DIV. 101 PARK AVE., NEW YORK

Keep them fit ... to keep it up!

KEEPING workers fit is a "must" on every plant production program! They cannot do their best for you or for Victory, unless you give them conveniences that tend to relieve fatigue and keep their energy up! A constant source of cool water is one such feature . . . Halsey Taylor Coolers and Drinking Fountains provide the answer. Types to meet every factory need . . . write for catalog.

THE HALSEY W. TAYLOR CO., Warren, O.

Halsey Taylor
Drinking Fountains

B-4

nitions and terms in existing standards. Primary aim in compiling glossary has been to express for each term the meaning that is generally associated with it in electrical engineering work. Field is divided into various groups and subsidiary sections, and the terms are arranged accordingly, to permit ready comparison of closely related terms.

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BOOKLETS

FREE ENTERPRISE, PRICE POLICY, AND DEMOCRACY. Edwin G. Nourse, The Brookings Institution. Washington, D. C. 33 pages. 25c.

LESSONS IN PRACTICAL ARC WELDING. Hobart Trade School, Inc., Troy, N. Y. Photographs, drawings, charts. 75c.

THE RECORD OF MANUFACTURING PROFITS, Statistical Department, National Association of Manufacturers, 14 W. 49th St., New York. 47 pages. Charts. One copy only, no charge; two or more copies, 10c each.

PLANT EFFICIENCY. Ideas and suggestions on increasing efficiency in smaller plants. War Production Board. Issued by Division of Information, Washington, D. C. 39 pages. Charts, drawings.

DISCUSSION OF INDUSTRIAL ACCIDENTS AND DISEASES. 1941 Convention of the International Association of Industrial Accident Boards and Commissions, Winnipeg, Manitoba. Bulletin No. 53. United States Department of Labor, Division of Labor Standards, Washington, D. C. 129 pages, 20c.

GUNS, PLANES, AND YOUR POCKETBOOK. Rolf Nugent. Public Affairs Pamphlet No. 59. Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York. 31 pages. Charts, drawings. 10c.

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ON THE CALENDAR

JULY

22–25, Silver Bay Conference on Industrial Relations, 25th Annual Conference, Silver Bay-on-Lake George, N. Y. E. H. T. Foster, Executive Secretary, 347 Madison Ave., New York.

SEPTEMBER

9–11, American Institute of Electrical Engineers, Pacific Coast Convention, Vancouver, B. C. H. H. Henline, National Secretary, 33 West 39th St., New York.

21–22, Illuminating Engineering Society, Wartime Lighting Conference, St. Louis. Frank G. Horton, Executive Secretary, 51 Madison Ave., New York.

25–26, National Association of Foremen, Nineteenth Annual Convention, Chicago. C. C. Kendrich, Vice President, 6755 West 65th St., Chicago.

Sailor—

WE EARNED THE NAVY "E"

Our pledge to the Navy

To the United States Navy and to the Nation, we of American Blower pledge the unstinted devotion of our experience, our ability, our effort. Whether destined for use on the battle lines, or to equip other essential industries for production of vital material — the products of our efforts, we pledge, will continue to measure up to the standard of excellence that is worthy of the commendation, "Well Done." We are proud of the privilege of working under the Navy "E" burgee — proud to wear the insignia conferred on us. By our progress in production, we shall continue to demonstrate our patriotism and determination to win. We are mindful of our responsibilities. We are working, and shall continue to work, for Victory!

MECH. DRAFT · AIR-CONDITIONING
AMERICAN BLOWER
FLUID DRIVES · DUST COLLECTORS

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN Radiator and "Standard" Sanitary Corporation

KNOCK DELAY out of your delivery schedule

● War products are reaching the armed forces sooner . . . getting on defense plant assembly lines ahead of time—thanks to Engineered Shipping Containers. Knocking delay out of delivery schedules—General Containers assure quicker assembly and packing, faster closing, easier opening for inspection.

General Containers are helping many war products producers beat shipping promises by saving man-hours in packing, handling and shipping all the way to destination. They are conserving space in ships, trucks, trains and in the shipping rooms. Tare weight is reduced. And the protection features of Generals assure safe arrival in perfect condition.

Don't let delays in your shipping schedule nullify your increases in production. General Box skilled technicians will help you determine the box, crate or special container which will best meet today's requirements. Mail the coupon for the free booklet—there is no obligation.

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General Offices: 504 N. Dearborn St., Chicago, Ill.
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☐ Send copy of free booklet describing engineered General Containers.
☐ Have a General Box engineer call.

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THEY SAY AND DO

Price Control Improves Labor's Position

A sharp check in the upward spiral of the cost of living was recorded in May, promising a decided improvement in labor's position. After advancing steadily at the rate of one full point a month from 95.1 to 97.1 in March and April, the National Industrial Conference Board Cost of Living Index rose but two-tenths of a point to 97.3 in May.

April figures, the latest available, for hourly and weekly earnings, meanwhile reached new peak levels. Average weekly earnings of all wage earners in 25 selected manufacturing industries advanced to $38.65 from $38.14 for March.

"The effect of the war on these earnings can be seen by comparing them with those in August, 1939, with May, 1940, and with November, 1941," the Conference Board reports. "In August, 1939, all manufacturing workers averaged $27.29 a week for 37.9 hours of work at 72 cents an hour. From these levels, hourly earnings advanced to 73.7 cents in May, 1940, and the work week was reduced to 37.5 hours. As a result, weekly earnings were increased to $27.67.

"By November, 1941, because of wage-rate increases and of overtime payments for a work week averaging 41.5 hours, earnings averaged 86 cents an hour and $35.74 a week. Increases in hourly earnings in the last five months have amounted to 4.1 percent and reached an average rate of 89.5 cents in April. The number of hours worked in one week rose 3.1 percent to 42.8. Weekly earnings advanced 8.1 percent to $38.65.

"In the same period, 'real' weekly earnings (dollar weekly income in terms of what it will buy) have advanced consistently. At 149.5 (1923 equals 100) in April, they exceeded those in August, 1939, and May, 1940, when they were at the same level, by 22.4 percent and those of November, 1941, by 3.4 percent. In general, weekly earnings of manufacturing workers have risen much more rapidly than have living costs."

•

Small Items, Big Savings Is Curtailment Story

By making no blackhead squeezers, tiny instruments used by beauticians, the United States will save 110,000 pounds of steel in the coming year—enough to make 4400 machine guns of 0.30 caliber or 110 aerial bombs weighing 200 pounds or four 155-mm. field guns, or three 15-ton tanks.

That's the story back of the War Production Board order ending the use of iron and steel in 400 familiar civilian products.

Women will do without hairpins and bobby pins, which will result in a saving of 16,000,000 pounds of steel—enough to make 160,000 0.50 caliber machine guns. And we'll get enough steel, 80,000 tons (not pounds, tons) to make four heavy battleships by doing without new metal signs such as those used on highways.

Ice skates and roller skates? By foregoing their manufacture next year, we'll save 12,500 tons of steel—more than enough metal to make 2,000,000 hand grenades. So it goes with barber shop and beauty shop furniture. No less than 10,000 tons of steel will be saved, the equivalent of 600 light tanks. No more metal waste baskets, either. The saving—1600 tons—enough for 29,000 3-in. trench mortars.

Young America will find new and different playthings under the Christmas tree this year, too, for WPB has decreed that "prohibited" materials cannot be used in the manufacture of toys and that only 7 percent of any toy can contain "critical" materials.

This order will save for war use: 100,000 tons of iron and steel; 2000 tons of copper, copper alloy, and brass; 1000 tons of lead; 3000 tons of rubber; and 3000 tons of zinc, to name but a few of the most precious of war materials. There is enough zinc in a single toy locomotive to make a carburetor for a "jeep" or a cover-cap on a projectile.

About 50 percent of this year's Christmas toys will be manufactured under the new restrictions. The rest were made beforehand. Toy makers got a head start on substitutions, however, and these are some of their ingenious developments:

Shimmering Christmas tree ornaments of spun glass and paper, in place of tinsel. (The tree itself will be set upon a stand of wood, not metal.)

Dolls stuffed with cotton instead of kapok, and dressed in cotton instead of rayon.

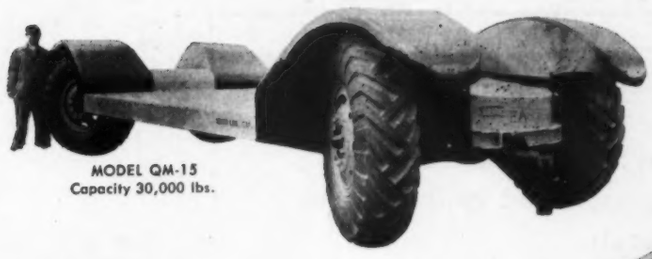
Velocipedes made of wood from the tips of their handlebars to the rims of their wheels with only enough steel to hold them together. Also wooden express wagons, wooden spring horses, wooden pedal cars, and wooden autos.

Sleds made wholly of wood except for a thin strip of metal—well within the 7 percent allowance—on the runners.

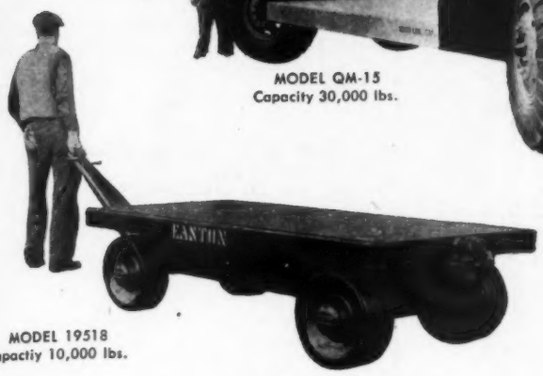
Wooden military toys of all sorts, including Garand rifles, machine guns, parade guns, cannons, anti-aircraft guns, forts, planes, tanks, jeeps, battleships, submarines, and, if you please, Commando barges.

About half of the toy industry's 600 plants will manage nicely with non-critical materials, but the other half, which has been accustomed to the essential materials will fare rather badly. It is estimated that about 30 percent of the latter can be converted to war work but others will have to limp along under reduced output and many may be shut down altogether.

A barrier to conversion is the fact that the toy industry is really only a conglomeration of unrelated industries devoted to light manufacturing in small plants and bound together only by a mutual market of 29,000,000 children. Most of the fac-



MODEL QM-15
Capacity 30,000 lbs.



MODEL 19518
Capactiy 10,000 lbs.

Model 1614—capacity 30,000 lbs.

MODEL 19034
Capacity 12,000 lbs

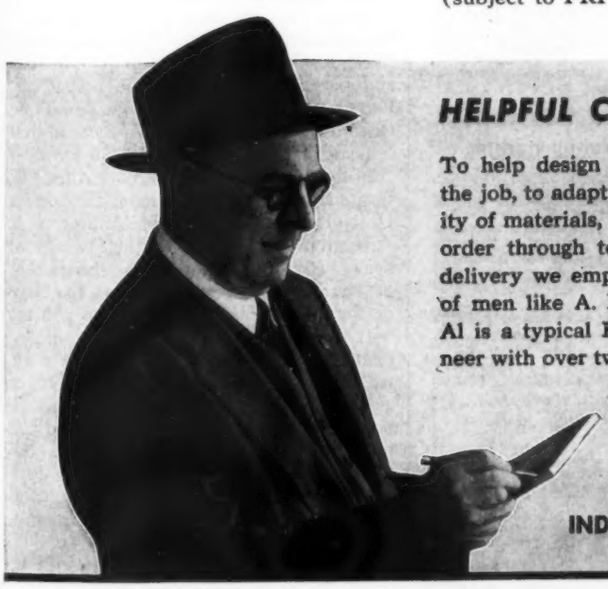
FOR IMMEDIATE ACTION!

ROLL YOUR LOADS on Trailers

ROCKER DUMP TRAILER
in Various Capacities

In new and converted plants a handling system using trailers is easy to set up, ready to go. Trailer haulage is adaptable to practically every job of moving materials, parts, waste, machines and heavy forms. Easton Trailers are rolling the loads everywhere along our industrial Beat-the-Axis front.

Easton Trailers are available (subject to PRP) for all purposes in capacities from 2,000 to 40,000 lbs. Easton can deliver wood or steel deck platform trailers, dump-body trailers, or specially designed trailers to meet unusual handling requirements. Two- or four-wheel knuckle steer, fifth-wheel steer, or caster type. Flat steel, solid rubber, or pneumatic tires. For manual or power haul, singly or in train. Timken bearing equipped.



HELPFUL COUNSEL ON YOUR TRAILER DESIGN

To help design your trailer to fit the job, to adapt it to the availability of materials, and to follow your order through to earliest possible delivery we emphasize the service of men like A. L. Schuller (left). Al is a typical Easton Sales Engineer with over twenty years experience covering all angles of industrial track and trackless haulage. For a free survey of your handling requirements, or for information on Easton Trailers to handle your loads, write to Engineering Counsel, Easton Car & Construction Company, Easton, Pa.

EASTON

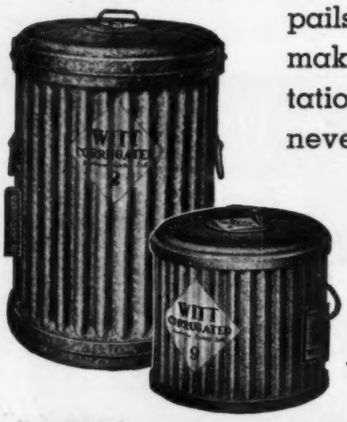
INDUSTRIAL CARS • TRAILERS • ELECTRIC LIFT TRUCKS

SOME *will be* DISAPPOINTED

With more and more steel needed for ships, shells, tanks and guns, there will be less for industry in general.

That means there will be fewer Witt Cans and Pails made for general use as long as this emergency exists.

But, regardless of the number of cans and pails we are permitted to make, the established reputation of Witt Quality will never be sacrificed.



Wherever *good* cans are used, the name Witt is highly respected.

The **WITT** *Cornice Co.*
Winchell Ave., Cincinnati, Ohio

LOW-COST GROUP HOSPITALIZATION and LIFE INSURANCE PLAN

A Good-Will and Efficiency Builder for Any Size Company

OFFERS THIS PROTECTION
To Employee and His Family

- ★ **Hospital Expense in Case of Sickness**
- ★ **Hospital Expense in Case of Accident**
- ★ **Surgical Expense**
- ★ **Hospital Fees (Laboratory, etc.)**
- ★ **Maternity Confinement Expense**
- ★ **Compensation for Time Lost from Work**
- ★ **Loss of Life Through Accident**
- ★ **Loss of Life Through Natural Cause**
- ★ **Physical Dismemberment**

A SECURE WORKER IS A HAPPY WORKER

FACTORY, OFFICE, STORE GROUPS

Unique North American Plan affords dependable financial help for Company Employees and their families in case of unexpected illness or accident. No group too small or too large to participate. Plan offers exceptional coverage for factory, office, shop and store groups. No age limit. No medical examination. Life Insurance optional. Inclusion of family optional. Premiums—only a few pennies a day paid by Employee.

Mail coupon for details on introducing plan in your Company. No obligation.

NORTH AMERICAN MUTUAL INSURANCE CO.
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Please send complete details on Employee Group Insurance Plan.
Name ..... Title .....
Company ..... No. of Employees .....
Address .....
City ..... State .....
(Attach coupon to business letterhead)

tories do not customarily work to close tolerances nor is the bulk of their machinery fitted for precision work. Although a few are equipped with large presses for use on heavy-gage metal, most use small stamping machines unsuitable for heavy war production.

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Post-War Jobs Pledged to U. S. Soldiers

America's fighting men will return from the front to find jobs waiting for them—that is the considered prediction of Eric Johnston, president of the United States Chamber of Commerce.

In a radio address not long ago, Johnston told the troops on the battlefronts:

"This is our pledge to you, men of our fighting forces. We will have jobs for you when you return to your country."

Business cannot allow another period of economic stagnation, Johnston declared.

"We of American business are planing for the future, working to find a solution to our post-war problems."

An optimistic echo to Johnston's pledge was sounded soon afterward by Thurman Arnold, Assistant United States Attorney General. Arnold flatly predicted a post-war economic boom unrivaled since the Napoleonic wars.

The war itself will liberate new techniques and new efficiencies, Arnold believes, and this will increase production and sales of goods.

"I see cheaper electricity, cheaper transportation, cheaper housing, and cheaper living after the war," he declared. "We will make our capitalistic system so efficient that all of us will get more of the good things of life."

Arnold dismissed as "defeatism" the idea that a post-war depression is inevitable. He termed pessimism "un-American" and declared that it is "responsible for the fact that groups are fighting groups for favored economic position."

"In making the capitalistic system sufficiently successful to win the war, this country will make it a system where the consumer dollar is worth more and where a farmer can get more for his products," he declared at a New York luncheon. "There will be a new age of light metals and plastics. The fat will be boiled off. Patent bottlenecks will be broken. The capitalistic system is the only system that can adequately distribute these goods."

Still another optimist is Arthur R. Upgren, chief of the National Economics Unit of the Department of Commerce.

Upgren foresees five distinct waves of heavy spending, similar to those that occurred in the decade following the close of the World War. In 1919, he pointed out, vast expenditures were made in new plant equipment while, at the same time, we had begun the export to Europe of about $5,000,000,000 worth of goods, particularly agricultural products. This was followed, he said, in 1922 by a residential housing boom, in 1926 by a heavy wave of consumers' durable goods buying, and in 1929 by heavy investments in producers' durable goods.

Four favorable, and three unfavorable,

DODGE VICTORY WOOD SHEAVES

Now—Dodge Offers the Victory Wood Sheave to Team Up with the Victory Wood Pulley

THE Victory Wood Sheave makes two important and direct contributions to the war effort. It provides an able, alternate power transmission appliance — maintains for industry the continued production advantages of V-Belt drive power transmission—vital to the upward spiral of production — vital to sustained production peaks. It releases tons and tons of urgently needed iron and steel for production machines and war machines where metal is a "must." It makes available for war work many much needed machine tools. A metal sheave is not necessary unless flywheel effect is essential.

The Victory Wood Sheave is not offered as a substitute — but as an alternate. It will transmit power just as efficiently as a metal sheave and offers plus advantages — inherent lightness — firm fastening to shaft — superior shock absorbing qualities.

The Victory Wood Sheave is sold on the same simple, satisfaction or money back guarantee which has been in effect on sales of Dodge Wood Split Pulleys for over sixty years. Over six million of these pulleys have been sold since 1882.

Use Dodge Victory Wood Sheaves for "DV" Drives where flywheel effect is not needed — secure the added advantage of lower price — help conserve metals and machine hours for the tanks, planes, ships and guns needed NOW for quick and total victory.

For prices and complete information on "VICTORY" Wood Sheaves, send for Bulletin A-333.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana, U.S.A.

THE RIGHT DRIVE FOR EVERY JOB

Keep Tools Handy!

Penco Tool Handling and Storage Units

for 'Round-the-Clock Production

No. 37 TOOL UNIT
Heavy-duty—all welded steel! 3 Drawers—for 3 shifts

No. 34T TOOL UNIT
Portable, Protected Storage! All welded steel for parts, tools, gages, instruments

No. 39 TOOL UNIT
Plenty of work-surface! Open type or enclosed with doors—all steel

•

War Industries—write for details and prices

1869 Penco

Penn Metal Corporation of Penna.

[illegible] Oregon Avenue, Philadelphia, Pa.

factors affect the outlook for the period following this war, Upgren said.

The favorable factors, he declared, are: (1) National income will have been at a high level; (2) the need for all types of goods will be great; (3) consumer debt will have been reduced; (4) heavy savings accounts and war bond investments will provide a financial cushion.

On the unfavorable side he listed the high rate of taxation, the prospective lack of a liquid position for industry after the war, and the possibility of a temporary decline in national income due to reconversion of plant facilities for peace goods manufacture.

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Views on Vacations Stated by Nelson

War Production Board Chairman Donald M. Nelson believes industrial workers in war plants should have vacations this summer if they can be scheduled without loss of production. Here is the official WPB policy as stated by Nelson:

"Experience here and abroad is indicating that the worker, even when stimulated by the urgency of the Allied war situation, cannot work long hours and maintain peak output indefinitely. We know that he benefits in peacetime from an annual vacation. After the extensive overtime and the added emotional strains of the war effort, we can be sure some rest period this year is going to prove doubly effective in the restoration of his energy and determination.

"In planning the vacation program in 1942, it is particularly necessary in each plant that American industry show its ingenuity in securing the vacation benefits without paying a counterbalancing cost in productive hours lost. This can be accomplished by doing work ahead in the departments affected, by further overtime of the workers not on vacation, by a special program of training of substitutes for those workers scheduled to go on vacation, by the spreading of the vacations over the whole year, in those sections where this is possible, and spreading them evenly over the full May-through-September period in those sections where the greatest vacation benefits are secured in summer.

"I am depending on American industry to embrace the vacation opportunity and solve its accompanying problem in a way that will not let our current output suffer and yet will fortify our working force for the still greater accomplishments that the President's program demands. Under no circumstances can the desire or need for vacation be permitted to excuse any shutdown of any department of any war production plant."

•

"Milling Practice" Film Aids Training

Sound films, an important weapon in America's "battle of production," are demonstrating their worth in training workers on a dozen industrial fronts. Now comes

WE CAN GET THESE KINDS OF RESULTS FOR *you*

1 One company is receiving an average of 500 suggestions a week from 3000 employees.

2 Another company is receiving 400 suggestions a week from 9000 employees for past 16 months.

3 A third company having 1110 employees is receiving an average of 145 suggestions a week constantly for past year.

4 500 suggestions a week from 25000 employees are being received by another company after 18 months experience.

•

★These companies, a few of our clients, report that many of the suggestions were usable and, through their application, production was increased—general betterments in shop practice were promoted—employee relations were improved—a closer bond of understanding between employees and executives was established—cost-cutting methods were developed—employees' active interest and active participation in departmental coordination was established plus other benefits peculiar to individual organizations.

★Worthwhile suggestions are hard to get through ordinary methods! Often much valuable time is lost and money spent in trying to apply a method not fitted to the need. Industrial Equities, Inc. (specialists) has designed a plan that will get full co-operation from employees whether the organization is a small one or one consisting of an exceptionally large personnel.

•

This is no time for trial and error! You cannot afford to postpone getting an effective system in operation. Our services and supplies are producing now . . . nothing experimental about the entire system . . . it can be applied to your plant at once.

One of our representatives will call on you at your request—or write for further details

INDUSTRIAL EQUITIES, INC.
310 S. MICHIGAN AVE., CHICAGO, ILL.

WHERE DO YOU *Go* FROM HERE?

FOR FABRICATED METAL PARTS » » TURN TO

● Write for this brochure. It shows where Lyon facilities can be used to best advantage in accelerating war goods production.

LYON
WAR PRODUCTS STAFF

This staff—which meets daily—has more than a year's experience expediting War Contracts. Its record for getting results has won widespread press comments.

● Getting a contract for War materials is one thing. Organizing to deliver it when and as needed is quite another . . . particularly when competent sub-contractors must be located, their facilities investigated, and their bids analyzed.

For products or parts of products fabricated from metal, turn to Lyon Metal Products, Incorporated, to get quick, positive cooperation, and "on time" deliveries. Our War Products Staff—representing all major departments—meets daily to expedite war contracts. This staff—widely experienced in handling special war products—provides a practical knowledge that saves time and eliminates false steps.

Back of Lyon's War Products Staff is one of America's largest and best equipped metal fabricating organizations. Lyon's modern plants cover an area of over half a million square feet. Each department is fully equipped for fast, precision handling of its particular job . . . utilizes the latest production machines, tools, and methods developed by our own engineers. Completely equipped tool rooms assure prompt production and maintenance of all necessary dies and jigs.

So, if your War Contract requires fabrication of No. 8 to No. 30 gauge metal—*come to Lyon for action!* Comprehensive brochure, "Craftsmen in War Production" describes Lyon facilities in detail. A copy is yours for the asking.

LYON METAL PRODUCTS, INCORPORATED

General Offices: 1207 Madison Avenue, Aurora, Illinois

Sales and District Offices Manned by Experienced Engineers In All Principal Cities

LYON METAL PRODUCTS, INCORPORATED

PECORA SHATTERPROOF LIQUID

For Government, Industrial & Institutional Plants

Avoids Flying Splinters from Broken Glass

APPLY TWO COATS BY PAINT BRUSH OR SPRAY ON INTERIOR OF GLASS WINDOWS

Coverage 250 Square Feet per Gallon—Two Coats

NET PRICES • F. O. B. PEABODY, MASS.

Furnished in 50 Gallon Drums

CLEAR at $4.00 Per Gallon BLACK OR WHITE at $4.75 Per Gallon

RESULTS FULLY GUARANTEED WHEN PROPERLY USED

Mail or Wire Your Order at Once. *Priority Must Be Furnished.*

80th ANNIVERSARY 1862–1942 PHILADELPHIA PECORA PAINT CO. INC.

PECORA PAINT COMPANY, Inc.

Established 1862 by Smith Bowen

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OILPROOF

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WRAPPINGS

As the largest manufacturer of specialty packaging papers, we have long made anti-corrosive and oilproof wrappings for annular bearings and small machine parts.

Recently, at the request of firms in the aviation industry, we perfected a complete line of special anti-corrosive wrappings for the protection and long-term storage of all metal products.

These papers have proven anti-corrosive properties, combined with oilproofness, strength, pliability and moisture-vaporproofness. They can be "tailor-made" to your specifications if necessary.

These papers meet the specifications in Section 16 of the WPB'S new Specifications for Packaging Ordinance General Supplies, as issued May 7, 1942.

Write for Samples and Technical Bulletin No. 83

RIEGEL PAPER CORPORATION

342 MADISON AVENUE, NEW YORK, N. Y.

"Milling Practice," a series of five sound-slide color films plus a review film, to spread skill and knowledge to thousands of American workers.

The first two films in the series are designed for beginners and learners in vocational schools, for unskilled men already at work in plants other than machine tool, and for those already engaged in the industry. The rest of the films are "heavier in material knowledge" and, therefore, more appropriate for men who have a working background of milling.

The films were produced in the huge Milwaukee plant of Kearney & Trecker, large-scale builders of milling machines and machine tools. The plan was conceived by Theodore Trecker as an answer to the problem presented when quantities of machines were found idle in new plants awaiting only skilled and semi-skilled manpower to get them into vital war production. Trecker training methods, developed through the company's own extensive teaching system, form the basis of the films.

When the films are shown, the training supervisor is supplied with a handbook containing complete questions and answers relating to the problems demonstrated in the films. The suggested training period is one hour per film, to allow ample time for classroom work. The course is available on a monthly rental basis or may be purchased outright.

Dr. H. A. Frommelt, director of industrial research at Kearney & Trecker, reports that the Course Construction Laboratory of the New York State Department of Education has warmly endorsed the films.

•

Tax Proviso Asked on Severance Pay

The United States Senate Finance Committee has been asked to revise the tax laws which currently put a heavy penalty on funds set aside by corporations for use as severance pay to war workers who will be jobless in the post-war period.

Under present laws, corporate funds earmarked for this purpose face a levy as high as 72 percent, with even higher penalties in prospect.

This was pointed out by Edgar M. Queeny, president of Monsanto Chemical Company, in a letter to Senator Bennett C. Clark of Missouri.

"We are undertaking the operation of four large defense plants," Queeny pointed out. "These plants will manufacture explosives, synthetic rubber materials, and gas protective products for the armed forces. When in full operation they will employ several thousand employees.

"The products of these plants have no peacetime use; the plants will be shut down when hostilities cease. We don't want to turn thousands of men out on the streets. We want to lay aside some of our earnings to tide these new employees over the inevitable period of readjustment, and we would like to provide for this now."